

JULY 1954

35 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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The Cover:

Robot TV Sights Forest Fires
—Page 97

THE '54 FORD
AND WHAT WE THINK OF IT

—By Floyd Clymer and the Ford Owners Themselves

For the Craftsman
Build Your Own Portable Barbecue

It's America's *VERSATILE* Outboard!



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- 2 39% greater power reserve—for operating accessories.
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- 5 Jet-styled Polystyrene case—lighter, and twice as strong as the finest rubber case.

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Attention Vacationists: If your present battery is $1\frac{1}{2}$ years old or more, it could die on your trip—out where you might have to buy an "off brand." Why not play it safe? See your Goodyear Dealer this week end about installing the dependable and power-packed Double Eagle 125. Goodyear, Battery Dept., Akron 16, Ohio.

GOODYEAR

BATTERIES FOR AUTO, TRUCK AND TRACTOR



We think you'll like THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

JULY 1954

This One

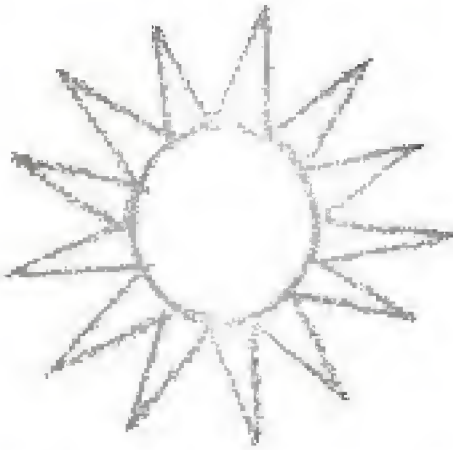
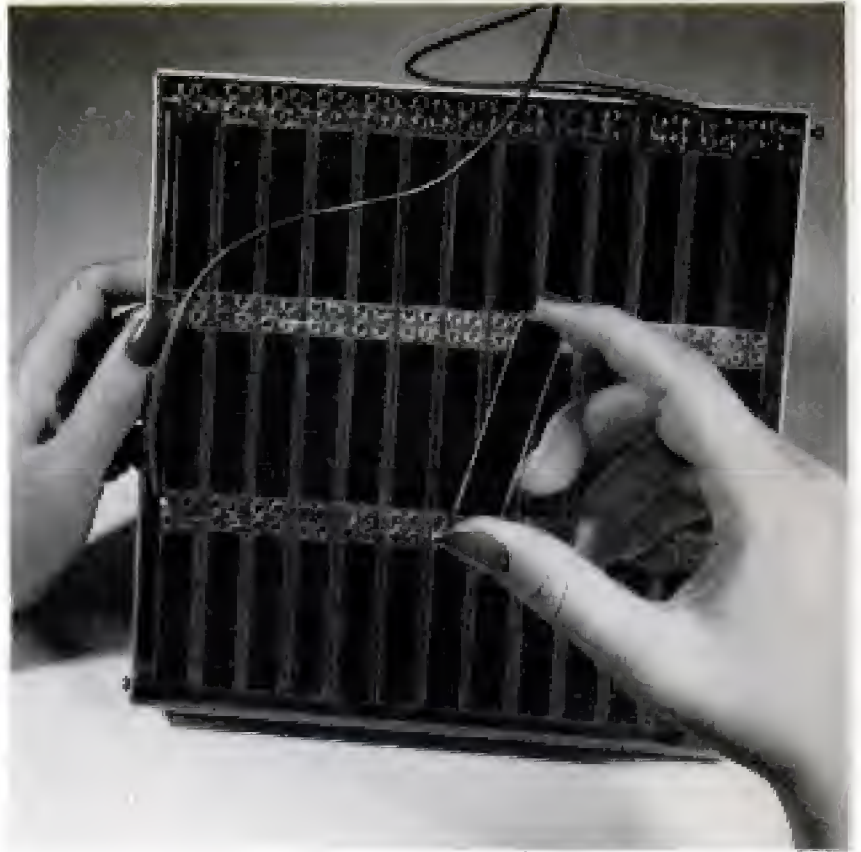


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The Bell Solar Battery. A square yard of the small silicon wafers turns sunshine into 50 watts of electricity. The battery's 6% efficiency approaches that of gasoline and steam engines and will be increased. Theoretically the battery will never wear out. It is still in the early experimental stage.



Bell Solar Battery

Bell Laboratories scientists have created the Bell Solar Battery. It marks a big step forward in converting the sun's energy directly and efficiently into usable amounts of electricity. It is made of highly purified silicon, which comes from sand, one of the commonest materials on earth.

The battery grew out of the same long-range research at Bell Laboratories that created the transistor—a pea-sized amplifier originally made of the semiconductor germanium. Research into semiconductors pointed to silicon as a solar energy converter. Transistor-inspired techniques developed a silicon wafer with unique properties.

The silicon wafers can turn sunlight into electricity to operate low-power mobile telephones, and charge storage batteries in remote places for rural telephone service. These are but two of the many applications foreseen for telephony.

Thus, again fundamental research at Bell Telephone Laboratories paves the way for still better low-cost telephone service.



Inventors of the Bell Solar Battery, left to right, G. L. Pearson, D. M. Chapin and C. S. Fuller—checking silicon wafers on which a layer of boron less than 1/10,000 of an inch thick has been deposited. The boron forms a "p-n junction" in the silicon. Action of light on junction excites current flow.



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H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

NO HUMAN EYE yet has seen that crackling fire, but the fire fighters know exactly where it is. Inside the plastic dome is a TV camera which revolves constantly to watch the forest. Fifty miles away a man scans several screens and suddenly spots the smoke. He checks the azimuth markings on the screen, then finds the same smoke on another screen. By plotting the two bearings he learns the exact location of the fire. The Louisiana Forestry Commission now is using TV cameras to spot fires. This is just one of many exciting developments in forest-fire fighting. A feature on page 97 shows how these ideas make "Every Man a Forest-Fire Fighter"

Information not listed on articles in the index, starting on page 12, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, Popular Mechanics, 200 E. Ontario, Chicago 11, Ill.

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Volume 102

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Number 1

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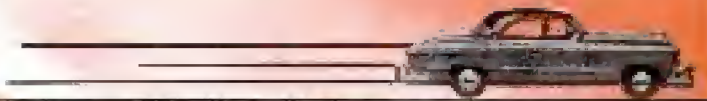
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Texaco



Tips on car care



How to get more miles from your tires

If your tires aren't inflated to the proper pressure, you won't get maximum mileage from them. To enjoy longer trouble-free life from your tires, see your Texaco Dealer for regular tire check-ups. He'll inspect the sidewalls for bruises and cuts. He'll check to make sure each tire is inflated to the correct pressure. If your tires show signs of uneven wear, your Texaco Dealer will detect it, make recommendations accordingly.

How to get that "cushiony" ride

Once Marfak lubricant goes on the job, it stays put — for one thousand miles or more. It's tough, extra stretchy (notice the sealing film of Marfak on the tie rod end). Marfak clings to chassis points of friction and wear . . . resists jar-out and squeeze-out for longer. For you, this all adds up to a smoother cushiony ride. And remember, your Texaco Dealer applies Marfak by chart — never by chance. Get Marfak lubrication today. See your Texaco Dealer . . . the best friend your car has ever had.



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 than a very thin gleam.
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 fly onto the premise
 He appears to be playing
 motorized tennis.



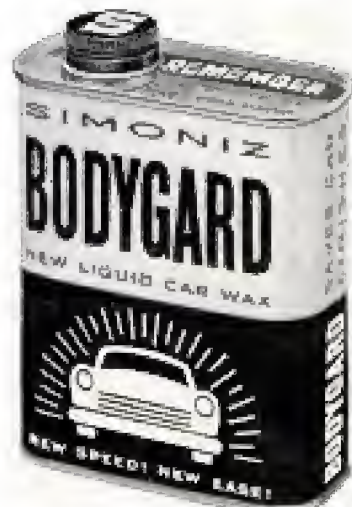
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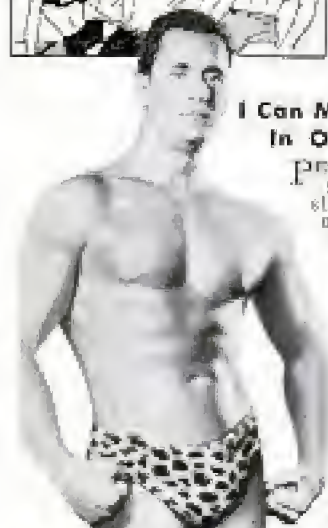
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Name _____ Age _____

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in this corner..... THE EDITORS



To the Editor:

I was aware that Popular Mechanics published several foreign editions. However, you might like to know that your English edition is read by a man in Iran who does not read English! The following account was received from our United States Operations Mission in Iran. It shows how a small businessman in an underdeveloped area made a success of a manufacturing business while contributing to our anti-malaria program in the country.

William J. Caldwell,
 Director, Office of Public Reports,
 Foreign Operations Administration,
 Washington, D. C.

☆☆☆

Hossein Moayeri, at 35, is a successful Tehran manufacturer whose craftsmanship, business ability and energy resulted



in his success and a great service to his country. If it had not been for Moayeri, the effort of the Iran-American Public Health Cooperative to eliminate malaria would have been greatly retarded and many more people would now have malaria.

Two years ago the malaria program in Iran faced a shortage of both DDT and spraying equipment. Technical cooperation was able to divert DDT stocks to Iran but was faced with delays of up to nine months in getting spray equipment. Then Health Division technicians discovered a few of the sprayers they already possessed had been made in Tehran by Mr. Moayeri's small factory. They informed him they needed several hundred spray guns by a certain date; he said he could make the

(Continued to page 8)

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equipment in time if he had two more special machines, and the material, for which he lacked funds.

Technical cooperation officials informed him if he would take the contract he would be given advances. He accepted and started immediately to design and make the two machine tools. He completed the contract satisfactorily. Since then he has had other technical cooperation contracts, has reduced the price of the original spray gun from 1200 rials to 650 rials so that it can be sold to many more villagers and farmers, [was able to] raise wages of his employees from 40 to 100 percent and has developed more efficient spray equipment.

Mr. Moayeri has been mechanically inclined all his life. After attending a trade school he entered the Iranian Army, was assigned to the Air Force as a mechanic. He served two years in the army and then returned to civilian life as a mechanic.

Through all the years he has been a close student of the American magazine known as *Popular Mechanics*, although he does not speak or read English. He states that he usually could get the mechanical ideas presented from just the pictures and drawings in the magazine.

Three and a half years ago he decided to become a manufacturer and opened a small factory which has since more than doubled. He now operates his own small foundry and has 12 lathe and machine operators. Several of the machines were designed and made by him including a large machine to "true" brass rods used for the manufacture of spray nozzles.

To the Editor:

I have read with interest your article "Does Earth Have Tiny Moons?" in the April 1954 issue, page 155.

Sponsored only by our wives and using homemade 6-inch telescopes and the public library, Richard Holpuch and myself not only believe but are certain we have discovered "moons" circling the earth. Our tentative results are in the hands of Harvard astronomers right now for analysis.

With regard to your article, there is no lower limit to the possible size of any "moonlets" circling our earth, they could easily be gravel-sized for example. The ones we have found to be visible in a 6-inch telescope are of necessity larger or we would be unable to see them, but many smaller ones may exist.

There is, incidentally, an upper limit to their possible distance from the earth (except beyond the moon) and it is some 45,000 miles less than the upper figure you

(Continued to page 10)

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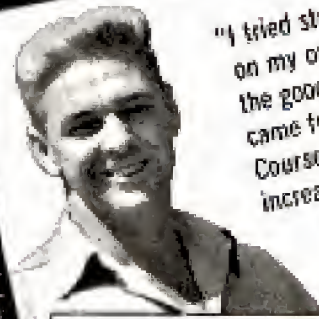
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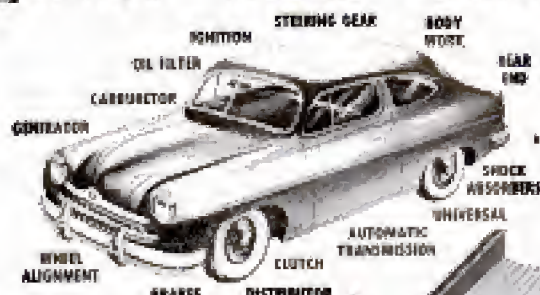
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(Continued from page 8)

mentioned. At this point and beyond the moon's gravity would capture them.

I must also disagree with your lower limit of distance as our own family of moonlets lies much nearer than this boundary. Even as close as 300 miles from the earth there is not enough atmosphere to slow objects down appreciably.

John P. Bagby,
Skokie, Ill.

To the Editor:

The article "Fourth of July the Year Around" in the April 1954 issue, was well written and excellently illustrated. However, there are several errors of fact which need correcting.

The micrograin propellant, mentioned in the article as "a type developed for use in military rockets," was actually discovered by two members of the Reaction Research Society, George James and John Cipperly, in 1943 and has never been used by the military in any way. Its low cost and ease of handling have made it an excellent solid propellant for the civilian rocket societies to whom the RRS has made the formula available without restriction or charge.

The Reaction Research Society, whose fight rocket graces the first page of the article, has erected a 40-foot launching tower and a two-ton test stand—largest facilities ever built by a nonprofessional group—at the Mojave Test Area. Its address is: Box 1101, Glendale 5, Calif. The Pacific Rocket Society address is: Box 698, Hancock Station, Los Angeles 44, Calif.

With thanks and appreciation of your interest in us and also in our friendly rivals, Arthur Louis Joquel II,
Reaction Research Society,
Glendale, Calif.

To the Editor:

On reading the article by Rafe Gibbs, "The Battle of the Sagebrush Busters" (PM, Jan. 1954), I have noticed an error in the term used for the Australian farmer. The correct colloquialism is "Cockies," not "Cookies." The term does not apply to farmers as a whole but mainly to those with small holdings on the coastal belt, the principal one being dairying. Out west of the divide, where station properties of 10,000 acres or more are common, they are known as "Graziers," wool and wheat being their main interest. . . . Floyd Clymer's survey is interesting as it keeps us in touch with the latest auto trends, majority of which we don't see out here due to the dollar shortage.

Bruce W. Chambers,
Sydney, N.S.W., Australia

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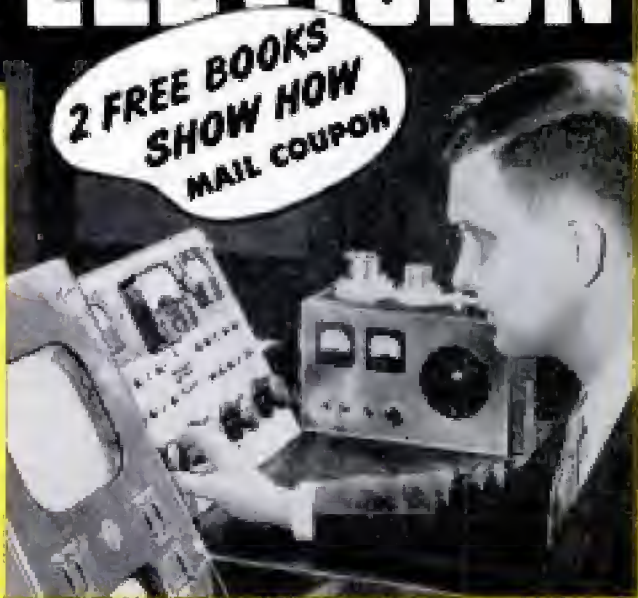
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INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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- Auto Body Rebuilding
- Auto Elec. Technician
- Auto-Engine Tune Up
- Automobile Mechanic

AVIATION

- Aeronautical Engineering Jr.
- Aircraft & Engine Mechanic

BUSINESS

- Bookkeeping and Accounting
- Advertising
- Business Administration
- Business Correspondence
- Certified Public Accounting
- Creative Salesmanship
- Federal Tax
- Letter-writing Improvement
- Managing Small Business
- Office Management
- Retail Business Management
- Sales Management
- Stenographic-Secretarial
- Traffic Management

CHEMISTRY

- Analytical Chemistry
- Chemical Engineering
- Chem. Lab. Technician
- General Chemistry
- Natural Gas Prod. & Trans.
- Petroleum Engineering
- Plastics
- Pulp and Paper Making

CIVIL, STRUCTURAL ENGINEERING

- Civil Engineering
- Construction Engineering
- Highway Engineering
- Reading Struct. Blueprints
- Sanitary Engineering
- Structural Engineering
- Surveying and Mapping

DRAFTING

- Aircraft Drafting
- Architectural Drafting
- Electrical Drafting
- Mechanical Drafting
- Mine Surveying and Mapping
- Ship Drafting
- Structural Drafting

ELECTRICAL

- Electrical Engineering
- Electrical Maintenance
- Electrician Contracting

LINEMAN

- Commercial
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- High School Subjects
- Mathematics

LEADERSHIP

- Foremanship
- Industrial Supervision
- Leadership and Organization
- Personnel-Labor Relations

MECHANICAL AND SHOP

- Gas—Electric Welding
- Heat Treatment Metallurgy
- Industrial Engineering
- Industrial Instrumentation
- Industrial Supervision
- Machine Design-Drafting
- Machine Shop Inspection
- Machine Shop Practice
- Mechanical Engineering
- Quality Control
- Reading Shop Blueprints
- Refrigeration
- Sheet Metal Worker
- Tool Design Toolmaking

RADIO, TELEVISION

- Electronics
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- Radio and TV Servicing
- Radio Operating
- Television—Technician

RAILROAD

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- Locomotive Engineer
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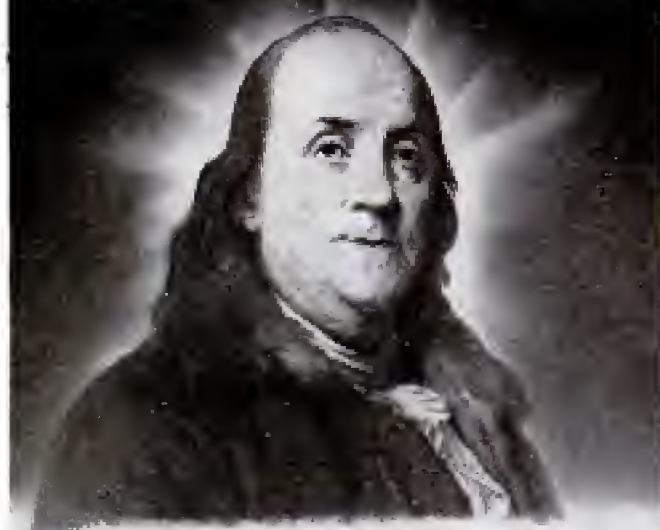
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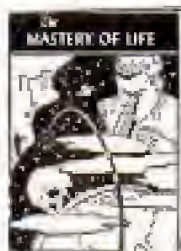


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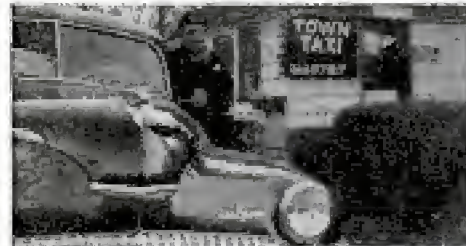
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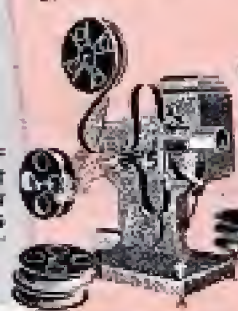
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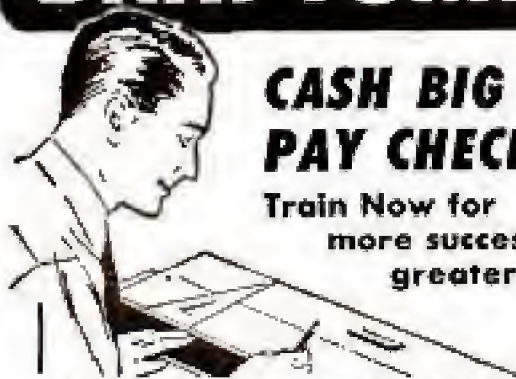


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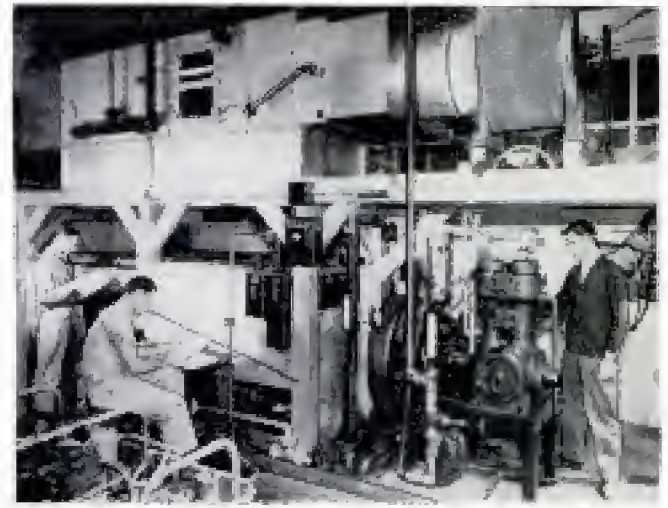
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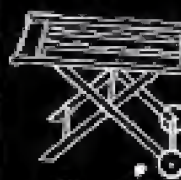
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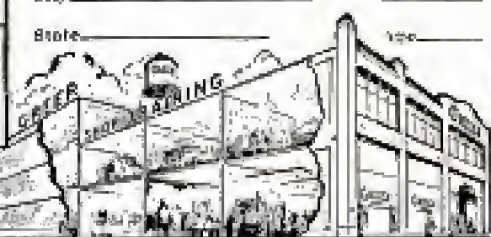
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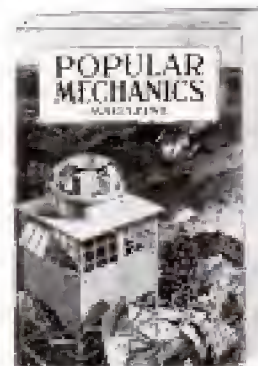
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8 JUMBO Prints in album 30c; 12 exp. 45c; 20 exp. 65c; 26 exp. \$1.25. Free mailer. Mel's Photo, Box 106F, Brooklyn 20, N. Y.

MOTION PICTURES AND SOUND EQUIPMENT

RECORDERS. Equipment. Reasonable. Fine recordings. Boynton Studio, 10 Pennsylvania, Tuckahoe, N. Y.

16MM. Sound projectors, used. Film 400' sound \$1.95. Free lists. National Cinema, 71 Day Street, New York City.

FREE: Blackhawk's summer sale catalog new and used films, 8mm. films, used 16mm. sound projectors, new 2" x 2" color slides. Blackhawk Films, 1245 Eastin, Davenport, Iowa.

8 & 16MM. Professional national parks movies in Kodachrome, 1st 10c. Ideal, 4644 W. Geary, San Francisco 18, California.

WILD Animal and bird films in beautiful color and b. and w. 2" x 2" slides and 8mm or 16mm movies. Write for free literature. Wild Life Films, 5151 AG Strohm Ave., North Hollywood, Calif.

8-16MM. Silent-sound film rental library. Free catalogue (sample film 10c). Garden, 317 West 50th, New York 19.

5,000 8-16MM. Silent-sound films, International, 2120 Strauss, Brooklyn 12.

CLEARANCE Sale of 16mm. sound films. Want a real buy in 16mm. sound films? Take advantage of the I.C.S. 1954 clearance sale of 16mm. sound features, comedies, cartoons, educational films, religious subjects—new, used. Send for our giant list "A" today, stating machine you own (make and model). Institutional Cinema Service, Inc., 1560-PM Broadway, New York 38, N. Y.

EARN Up to \$15.00 daily with your movie projector! Details free! Metcalf, 10886 Glenroy, Chicago 43.

MOVIE Camera film: 8mm. roll \$1.50, 15mm. 100' \$1.00. Free processing. Better Films, 742 New Lots, Brooklyn, N. Y.

TAPE Recorders, tapes, accessories. Unusual values. Dresser, 425-M East 20th Street, New York City 9.

GUARANTEED Fresh 8mm. roll, magazine: 16mm. roll, magazine movie films. Color, b&w. Free catalog. ESO-R, 47th Holly, Kansas City 2, Missouri.

16MM Sound projectors, film, rental, sale. Free catalogs. National Cinema, 71 Day Street, New York City.

MUSIC AND MUSICAL INSTRUMENTS

SONGWRITERS! Outstanding offer. Ray Hibbler, C-5, 8838 Obeander, Chicago 31, Ill.

1854 ACCORDIONS—Wholesale. Free catalog. American Accordion Center, PM-7, 3320 Belmont, Chicago.

NEW Songwriters can now sell their songs! My new, easy method reveals professional secrets of profitable songwriting. Free details. Meadowlark Music School, 360 Sumner Road, Colorado Springs, Colo.

POEMS Wanted for musical setting. Send poems. Free examination. Five Star Music Masters, 830 Beacon Bldg., Boston, Mass.

AMATEUR Songwriters! Top-notch Broadway staff offers expert professional opinion—suggestions for improving your song or lyric. Enclose \$1.00 with each manuscript or recording. Amateur Songwriters Workshop, P.O. Box 389A, Times Square Station, New York 36, New York.

MUSIC Arranged, songs printed. Frank Wild, Music Publisher, Lancaster, Penna.

WANTED! Poems for musical settings. Write Songwriting Service, 2959 Division, Chicago 23.

SONGS Arranged—Prepared for publication. Melodies composed. Royal Crown Music Co., 1658 Broadway, New York 19.

WANTED! Poems for musical settings. Write Songwriters' Service, Clifton, N. J.

YOUR Voice made loud, clear and powerful with my diaphragm exerciser. Inexpensive. Write, Inventor Co., 34V, Box 668, St. Louis, Mo.

ACCORDIONS, Wholesale to everyone. Save up to 40%. All national known brands. Free catalogue. Del Principe, 29 South Cicero, Chicago 44.

SONGPOEMS Wanted. Mail to: Tin Pan Alley, Inc., 1650 Broadway, New York 19, N. Y.

POEMS Wanted for musical setting. Send poems. Free examination. Crown Music Company, 1475 Broadway, New York City 36.

FREE Record of your song. Your words, my melody. Free information. Johnny Mack's Melody Mart, 1094 West 39th Street, Dept. A, Los Angeles 37.

SONGWRITERS! Protect your ideas! Hold all songs, poems! Write for safe correct procedure first! Song Service, Dept. F, 333 W. 56th St., New York 19, N. Y.

POPULAR Songs. How to write and sell them. Write for free booklet Successful Songwriting, Gateway Songs, Box 2470, Hollywood 28, Calif.

SONGWRITERS! Send poems, songs. Music Service, 243 West 12nd St., PM, New York 23.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 4700 South California Avenue, Chicago.

POEMS Wanted for musical setting. Send poem for immediate consideration and free rhyming dictionary. Richard Brothers, 24 Woods Building, Chicago 1.

RADIO AND TELEVISION

NEW TV catalog free. Loaded with bargains for TV servicemen, technicians, installers. Finest new TV antennas, motorless directronics, multi-channel 7x6's, 6HF antennas, converters, motors, boosters, parts, instruments, hundreds of quality accessories at money-saving prices. Get your catalog now! National Electronics, 3007 Delco Bldg., Cleveland 3, Ohio.

REPAIR Your own TV. Detailed instructions prepared exclusively for your model—Plus introductory bonus. Send make, model, \$1.00. Personal TV, Box 66, Little Neck, N. Y.

EXPERIMENTERS. Build a sensitive, selective crystal receiver. Send 50 cents for copyright plans to Colter, Box 60, Boston, Mass.

HEAR Speaker for auto radios. Easy to install: no special tools needed. Selector switch operates front, rear, or both speakers. \$9.95 postpaid. Guaranteed. CPJ Sales, 544 Nelson Pl., Dept. 1, Newport, Ky.

RADIO TUBES, all types, guaranteed. Ideal Service, 4644 Geary, San Francisco 18, California.

BUILD 15 Radios at home—Only \$18.95 complete. Learn radio construction, theory, trouble-shooting, code, F.C.C. regulations. Complete radio course includes all parts, components, instruction books, etc. Free radio tester and soldering iron. You keep everything. No experience required. Money-back guarantee. Order direct or send for descriptive literature. Valuable radio and TV guide upon request, free of charge, no obligations. Progressive Edu-Kits Inc., 497 Union Ave., Dept. PM19, Brooklyn 11, N. Y.

SAVE—Fix any TV set. Illustrated, diagrammed, easily understood copyright book. Diagnosing, correcting TV troubles. Explains functions, phases. 2nd edition ready. Send \$1. Telefax Co., 1833 Woodward, Detroit 3, Mich.

INCREDIBLE! One tube radio receives television, FM, CAP and amateur broadcasts. Very easy and inexpensive to build. Diagram with special tube only \$2.00. Springfield Enterprises, Box 54-BT, Springfield Gardens 13, New York.

TELEVISION Antennas. Build for profit. Dimensions, drawings. Channels 2-13. \$1.00. Electronics, 29-C Climer, Burlington, Vermont.

REPAIR Your own TV! Instructions compiled exclusively for your model. New, expanded book makes repairs simple as replacing light bulbs. Send set name, model number, \$1.95. Satisfaction guaranteed or money back. L.S. Engineering, Box 4113R, No. Hollywood, Calif.

FREE. Get on our radio and electronics mailing list. A.R.I., Box 1433, Denver, Colorado.

CRYSTAL Radio experimenters. Write Leslie Hulet, R4, Lakewood, New Jersey.

MAKE Simple, tubeless, batteryless, distance-getting radio. Genuine Melomile crystal, detector, illustrated instructions. 50c postpaid. Allen, 437-PM3, Clinton, Missouri.

PHONOGRAPHS Attached to any radio by anyone. Instructions \$1.00. Box 601, Phenix City, Ala.

BUSINESS OPPORTUNITIES

METALIZE Baby shoes, jewelry, gifts. Bronze, gold, silver. Free bulletin. Kiklav, 7217-PY South Broadway, Los Angeles 3.

\$1000 MONTHLY Possible from your own easily learned office business. Write Cole Associates, Syracuse 2, N. Y.

COST Of things going up faster than your income? You can make more full or part time as a Rawleigh dealer. Write for full particulars. Rawleigh's, Dept. G-RH-PPM, Freeport, Ill.

FORTUNES Made raising crickets and fishworms. Raising and marketing instructions. \$1.00. Breeder redworms. \$4.50 per 1000 postpaid. Carter Farms, Plains, Georgia.

NATURAL Molding rubber, extra thick. Free sample. Plock, W. Woolley, 115-A Donald, Peoria, Ill.

WHAT'S Your field of interest? Whatever it is, specialized magazines will help you get ahead. Examine current copies of those covering your field through our easy-to-get-acquainted service. Choose from 4387 covering all fields—business, trades, agricultural, professions, insurance, real estate, music, educational, hobbies, sports, etc. Current list free. Commercial Engraving Publishing Company, 34C North Ritter, Indianapolis 18, Indiana.

RED Hot home business. Big profit. Details and material 25c. Diaz, Box 11378, Tampa, Florida.

BIG Money selling and installing this new, low-priced burglar alarm. Real protection for homes, shops, stores, etc. Write for details. Protect-O-Larm, 6012 Irving Park Road, Chicago 34.

OWN A garden golf business. Experience unnecessary. Brockway, Seaside, Oregon.
FREE Literature. Fishworms \$00—\$1.00. Breeders' Manual, \$1.00. Postpaid. Dixdok, Kent, Ohio.

IMPORT! Coffee, cigarettes, novelties, consumer goods. Opportunities bulletin 25c. Warner, Box 6, Fort Scott, Kansas.

SELL Popular Mechanics and all other magazine subscriptions. Free catalog, supplies. Subscription Service Company, Dept. A, P.O. Box 2070, Birmingham, Alabama.

PROFITABLE Home business, 60 ideas free. Oren Robertson, Bonita, Louisiana.

WANTED! Home producers, by manufacturers in our clearing house service. Become subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer-industrial use. Cash in at home, without previous experience. Plastic Service Associates, Dept. 1-PM, East Boston 23, Mass.

MAKE Rubber stamps, repair dolls; learn silk screen printing. Catalogue (60 ideas) free. Universal, Box 1076-A, Peoria, Ill.

MAKE Money by mail order. Free catalogue shows how. Details free. Opportunities Unlimited, Dept. 6, Box 1576, Boston, Mass.

OPPORTUNITY Seekers write James Leigh, 537 Chester Street, Oakland 20, California.

\$1000 MONTH Raising earthworms. Instructions 25c. Wigler Farms, Burt 3, Michigan.

OPERATE "Escalator" mailorder system, selling our products or any products. Write: Selbyco, Decatur 25V, Illinois.

PROFITS At home molding jungle masks, wall plaques, etc. Instructions and sample to copy. \$1.00. Cera-Masques, Box 481, Pontana, California.

LIQUID Rubber, make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

FREE Booklet, "Mail Order Confidential." Elsen, Box 1631-F, Fargo, N. Dak.

LIST Your name in "Big Mail." Get many offers. 23c coin. Refundable. Walter Rix, Box 6521-A, Cleveland 1, Ohio.

GET \$10 Orders by mail! 100% profit! Everything furnished. Terrell, Bogard 10, Mo.

MAKE Perfumes, other products. Sell mailorder. Formula catalogue free. International, 6347 Parnell, PM-7, Chicago 21, Illinois.

LEARN Sewing machine repair, electrify, trade, sell. How to make big money at home sparetime. New zigzag machines, parts, etc., wholesale. Free details. Taylor Service, Hamilton PM-7, Ohio.

EARN Extra money, spare time, from typewriter or sewing machine. Free details. McKinley Home Enterprises, 817-A Park S.W., Canton, Ohio.

MONEY, Typing, sewing! Details free. Edwards, 3915-PM, 12th, Des Moines 13, Iowa.

BECOME A game warden, or join forestry, park, lookout, wildlife conservation services. Enjoy outdoor work, good pay, real security. Complete information free! Write Home-Study Institute, 3156JV West Eighth, Los Angeles 5, California.

EXPORT Business easy made! Substantial income from home. No merchandise buying. Full setup service, includes everything. Hermes Exports, 162 West 42, New York 18.

TIN-Cans. Turn them into cash. Nine methods, instructions 50c. Charles Company, 12-DCA, Norwood, Ohio.

OPERATE Sewing machine repair business from home. Our guaranteed plan assures success. Easily learned. Amazing profits. Write immediately. Puddy's, 1416 1/2 North Rusk, Weatherford, Texas.

FREE Wholesale catalog! Make up to 300% profit! Novelties, gifts, premiums, costume jewelry, wrist watches, housewares, name brand merchandise. No junk, sell to stores or individuals. Write for catalog No. 5. Heath Distributing Company, 508 Broadway, Macon, Georgia.

IMPORT-Export: Opportunity, profitable, world-wide, mail-order business from home, without capital or travel abroad. Established world trader ships instructions for no-risk examination. Experience unnecessary. Free details. Meilinger A791, Los Angeles 24.

MAILORDER—Operate profitable home business using free advertising method. Reselling information free. Seidel, 7070-RF Hollywood, Los Angeles 28.

START Your own business at home. Sell subscriptions for popular magazines. Liberal commissions. Send for supplies, etc. DeSales Magazine Service, 40 East 42nd St., New York 17, N. Y.

BUY Wholesale. Thousands items. Free lists. Triple J Industries, 132 Berkshire, Bridgeport 8, Conn.

EARN \$2.00 Hour! I do—making sandals. Young's, 1308-PM, South First, Arcadia, California.

WANTED—New items for mailorder. 50% drop-shipment. \$1.00 to \$10.00 sellers. F. Childress, R-1, Taylors, South Carolina.

FREE! "301 Profitable Small Businesses!" Amazing shoe-string plan! Work home! Start sparetime! DeLmont Surreys, Kenmore 21-PM, N. Y.

NEWEST Spare, full-time home business. \$5 to \$10 hour possible. Paint with suede—The finish with touch and eye-appeal. Beautifully auto dashboards, signs, radios, toys, figurines, lamps—1001 others. Complete, step-by-step instructions sent for no-risk examination. Free details. Coast, 1004-MW So. Los Angeles St., Los Angeles 15.

START Your own business on credit. Your own boss. 1633 of our dealers sold \$5,000 to \$27,500 in 1953. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. G-U-PPM, Freeport, Ill.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. MX-734, 7530 Greenwood, Chicago.

GROW Orchids at home—Profitable, fascinating. Year 'round. Maine to California. No greenhouse. Gorgeous cattleyas, cymbidiums, etc. Successful home grower shows you how. Full details free. Flowerland, 4622-PC Wilshire, Los Angeles 3.

MAKE And sell rhinestone jewelry. Rhinestones 25¢ gross. Free catalog. Ebert, Box P133, East Orange, New Jersey.

STEADY income at home; mailorder or local. C. C. Graham, 1288 Granger Ave., Lakewood 7, Ohio.

FREE! Complete mailorder business. No investment! Everything furnished! Terrific profits! Write today. Veejay Vitamins, 18707 Cimarron, Los Angeles 18, California.

FREE Wholesale price list—Refrigerators, television, silverplate, watches, gifts. Belmont, 202 Hinsdale St., Brooklyn 7, N. Y.

BUY Wholesale. 4,000 name brand items. Start your own business. Wide open field. Profits unlimited. Catalog No. Wholesalers Mart, P.O. Box 8125E1, Houston, Texas.

BOOKKEEPERS! Keep books, small firms. Spare time. Hefferman, 27-08 Jerusalem Avenue, Wantagh, New York.

\$15 AN Hour, Become tax expert. New tax law enormously increases demand for tax consultants. Dignified year-round business. Work home or office; full, spare time. We train you, experience unnecessary. Free details. Union Institute, Lakewood 2-L, N. J.

HOME Business—Mailing literature to new mothers. Details free. K & M Products, 3634-A Homewood, Toledo 12, Ohio.

COFFEE Going higher, sell substitute. Formula \$1.00. Krysti, Felton, Calif.

BLEAKS Famous baitment really repeats. \$1.00, refundable. Frank Black, Junction City, Wis.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 627-P Linden, Buffalo, N. Y.

EARN \$100 Month, easy, breeding hybrid earthworms. Big demand. No expenses. Free information. Earthworm Gardens, 19 Peacock Bldg., El Monte, Calif.

WHOLESALE Catalog free. Name brand watches, appliances, cameras, sporting goods. 1000 tested sellers. General Wholesalers, P.O. Box 3088EP, San Francisco, Calif.

FRANCHISE Opportunities nationwide. Secure details immediately. National Franchise Reports, 220 N. Michigan Ave., Chicago 11, Ill.

WHOLESALE Prices. Quality printing. Free catalog, samples. Dealers wanted. Station Printing, Box 653-M, Waycross, Georgia.

RAISE Earthworms! Easy! Profitable! Dime brings information plus unusual true story, "An Earthworm Turned His Life." Earthmaster System, RR, El Monte, Calif.

FREE Folio describing "445,000 Unlimited Vacations Plan." No canvassing, mail-order, merchandise, equipment. Unknown. Works itself—home! Keep Job. Hayling, Carlsbad, Calif.

IMPORT—No risk plan offers big profits. Sparetime. Showing Mexican hand tooled leather hand bags, hand painted skirts. Frontier Imports, Box 3032, Sta. A, El Paso, Texas.

MAIL Order business. Send for supported catalog from manufacturers rep. 286 pages, over 3000 items for only \$5.00. Bakalich, 1149 East Pico Blvd., Los Angeles 21, Calif.

START A profitable cash business in your home. Tested plans and copyrighted instructions. Circular free. G. Bowman, 7119-C Clyde Avenue, Chicago 49, Illinois.

SELL Name brands—No inventory. Maintenance, 225 W. 57 St., New York City.

ALUMINUM Awnings—Sell yourself, sell neighbors. Baked enamel colors. Factory prices. Write Groff, Box 10234, Tampa, Fla.

I Average \$125 weekly selling books by mail! So can you! Start sparetime! Work home! Cooper, 245 Taunton, Buffalo, N. Y.

MEN Wanted—Build luggage and cases at home. We sell your products, supply complete instructions, materials, everything. No special equipment needed. Free details. Cascraft, 805-G7 Sunset, Los Angeles 13, Calif.

PRINT Without a printing press! Amazing new method! Print colorful signs, banners, cards, posters, glassware; anything at home. Big profits. Money-making opportunity! We supply everything. Beautiful sample, home-business plan free! Write Screen-Print Company, Los Angeles 15, California.

\$300 A Year sparetime sharpening saws at home. No selling. Hardware stores get saws on commission basis. Free booklet tells how. Victor Foley Company, Columbia Heights, Minnesota.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience. No capital needed. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 506B, Mount Morris, Ill.

OVER 700% Profit making finished photos in 2 minutes on the spot in daylight without darkroom. No experience needed. Simple directions teach you quickly. Write P D Camera Co., 1161 N. Cleveland Ave., Deps. PM, Chicago 16, Illinois.

ELECTROPLATE Auto parts, novelties, mirrors, baby shoes. Easy, inexpensive home processes. Free booklet. Tyeo Metals, Box 12331-MM, Houston 10, Texas.

BOOKKEEPERS, Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 406, Youngstown 1, Ohio.

MAKE Money at home doing easy pleasant work. Everything furnished. Good earnings. Write, Murray's, Box 4006, Meil Park Station, Flint 4, Michigan.

MAKE Money at home—Mail cards, circulars feature real merchandise. Everything furnished. Big earnings. Phillip's, Box 8-P, Boston 22, Mass.

UNUSUAL Mail order ideas, sources. Details free. Fax, Box 241, Brownwood, Texas.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

LEARN Metalizing baby shoes, gifts, etc. Bronze, gold, silver. Folio free. Kiklavii, 7217-PM South Broadway, Los Angeles 3.

WHOLESALE Of sensational nationally advertised appliances, silverware, watches, cameras, etc. Start your own business. Full details. Send 50¢ for catalogue. International Sales Co., 175 Fifth Ave., New York 10, N. Y.

START Venetian blind laundry. Profitable lifetime business. New machine. Free booklet. F. C. Co., 442 N. Seneca, Wichita 12, Kansas.

UNUSUAL Homebased opportunity, spinning Angora sparetime for us. Men, women. Angora House, PM, Springfield, Illinois.

HOW And where to obtain capital. Pay-licitors free. Star Service, Wapakoneta, Ohio.

MAKE Money at home. Write, Falcon House, Winnebago 2, Ill.

TO \$40.00 Weekly, Sparetime, home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34, Calif.

PUBLISH Mail Sale Advertiser, leading mail order paper. Details, latest copy, dime. Vanroy Shirk, Lebanon, Penna.

EARN Money at home! Homemaker Magazine tells how. Sample, 25¢. Stearns, Box 7, 4917 Kostner, Chicago 38.

DOLLARS in personalized baby record books. Sell by mail. Eleven thousand new prospects daily. Use same literature we do. No-Co-No, Oakland 6, California.

SCHEMER Magazine, Centfield 1, Ohio, monthly mailorder ideas, plans. Year \$1.00. Sample 20¢.

PLASTERCRAFT Molds, liquid rubber, plasters, flock, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

BUY 14 wholesale! Manufacturers, distributors offer \$50,000 items. Literature free. Olsen, 1231-A East Third St., Duluth 5, Minn.

GROW Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.30 lb. We paid Rabbit \$4.165.00 in few weeks. Free book, Washington Mushroom Ind., Dept. 172, 2954 Admiral Way, Seattle, Washington.

POPCORN And potato chpt equipment. Leco, Box 833-A, Springfield, Ohio.

\$45 FROM Square foot plywood; glass necessary. Write: Woodarts, Bridgewater, Mass.

BUY Wholesale thousands items. Lists free. Cottage Industries, Omaha 13, Nebr.

\$25 WEEKLY Working two hours daily at home. Lyeko, Box 2471-A, Cleveland 13, Ohio.

BREED Rare tropical fish at home. Earn big money! Learn secrets! Help fill huge demand. Amazing opportunity! Free plan, Tropicals, 1900-F Los Angeles St., Los Angeles 15.

INCOME From local information. No selling. Write Neherco, La Verne, Calif.

SILVERING Mirrors, formula 50¢; two-way looking mirrors. (No one sees you), 60¢; coppered mirrors, 50¢. All \$1.00. Neko-Mir, Box 3462-J, Chicago 54.

LIVING Miniature ("Ming") trees only 10 to 20 inches tall. Grow at home. Big profits! Spare time opportunity. Fascinating! Amazing! Write for free seed and plan. National Nursery, Dept. FC, Inglewood 4, California.

MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for autos, soldiers, ashtrays, banks, etc., keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1690 Boston Road, New York 60, N. Y.

OPERATE Profitable mail order business. Write Walter Service, 4158-A East 112th, Cleveland 5, Ohio.

GOOD Paying business silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required. Outfit furnished. Free booklet. Quanzel Co., Ave. H, Decatur, Illinois.

MILK Raising information free. Complete. Lake Superior Milk Farm, Superior. EEL, Wisconsin.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Pottery Company, Grand Rapids, Minnesota.

FREE Book "505 Odd, Successful Businesses" Work home. Expect something odd! Pacific, OceanSide, Calif.

PIX Typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write Typewriter, Building 1, Tarentum, Penna.

MONEY in new greaseless doughnuts. Start in kitchen. No smoke. Sell stores. Free recipes. M. Ray Company, 2609 South 15th Ave., Minneapolis 7, Minn.

BRONZED Baby shoe supplies, instructions, mountings. Metal bookends, \$1.50 pair. Free catalog. National Bronze Supply, Box 59, Los Angeles 32, Calif.

FORM A buyers or consumers group. My plan successful. Excellent money-making opportunity. Free details. Putnams, Box 714, Columbus Grove, Ohio.

MAKE Flexible molds. Cast figurines, plaques. Free sample. Tooker, 630-R Chestnut, Hamilton, Ohio.

START Profitable spare time business. Co-publisher "Mail Order World" leading trade magazine. Opportunities and invaluable information for beginners. Sample copy 25c. Beecher Publications, Box 2161-B, Cincinnati 1, Ohio.

START Your own mail order business. "Mail Order Business Manual" reveals proven methods. No crackpot schemes. Bud E. Hine, Box 92, Battle Creek, Mich.

MONTHLY Repeat business which you can operate in your own community. For free details write Grassak, 321-28th Street, McKeesport, Penna.

COLOR Concrete with chemicals. Marble-glass cement benches, pottery. Start, home, shop. Many designs: birdbaths to waterfalls. Your chance for fame, fortune. 10c brings sample, pictures. Write: Hollywood Cementcraft, 8527-R Wonderland, Hollywood 46, California.

MAKE \$50.00 Per day selling room air conditioners. Buy wholesale. Box 793, La Crosse, Wisconsin.

MAILORDER Home business! Details sent. Shafley, 20-Ragsburg, Baltimore 6, Maryland.

MILLION Articles wholesale. Supply source directory 10c. Dealer, Park Ridge, Illinois.

SELL Books, merchandise by mail. Good profits. We furnish circulars, names—Ship your orders. National, Box 88, Dorchest'r, 220, Mass.

MONEY Getters club! Receive 1,000 or more different money-making propositions. Year's membership now only 25c. Satisfaction guaranteed or money back. Storm-Associates, Cedarville, New Jersey.

\$25,500 SALES in two weeks! Amazing radio-mail order method. Free details. Broadcast Service, 1412-T Great Northern Building, Chicago 4, Illinois.

MONEYMAKING OPPORTUNITIES

TESTED Plans for home operated business. Free details. Christ Sales Company, 13 Brown Avenue, Cortland, New York.

START Home mailorder. Details. Gilbert, 1434 W. Washington, Petersburg, Virginia.

MONEY Making plans and manuals. Literature free. Kaiser, 136B Gamewell, Hackensack, N. J.

400 RADIO Stations active. Free radio advertising. Pay commission only on orders received. Free information. Mischek, 10, Wasena, Minn.

ATTENTION: Typewriter owners. Make handsome profits. Write today. Groves Company, 682, Hastings 8, Nebraska.

24 MONEY Makers 10c. Midwest Sales Co., Nevada 294, Mo.

PRESERVE Living flowers to last indefinitely. Interesting! Profitable! Maxson, Falls Church 18, Virginia.

NEW Baby items. Agents, salesmen, distributors. Natural for mail order. Write: Liebig Industries, Beaver Dam 3, Wis.

MEN, Women: Add \$50 weekly to present income. No selling or collecting. Chamber of Commerce approved. Write today for information. Independent Driver Training, 1301c Shaffersburg Road, Dayton 6, Ohio.

100% PROFIT! Mexican featherbird pictures. Hat sellers! Edmunds, 2009-F Weaver Ave., Baltimore 14, Md.

NEED Extra money? New plan. No investment. Sparetime. Sample, details free. Transamerican, Box 815-A, Atlanta 1, Ga.

FREE! "501 Profitable Small Businesses!" Amazing shoestring plans! Work home! Start sparetime. Deumant Surveys, Kenmore 23-PM, N. Y.

CRAZY Wiggling mice. Raise these funny pets. You can't buy them anywhere. Try to. Special offer. Details free. S. E. Keegan, 7435 Midl Road, Philadelphia 17, Penna.

\$200 MONTHLY Possible raising earthworms! Backyard, garage, basement. Complete, illustrated booklet explains raising, feeding, packing, marketing. 25c postpaid! Ozark Worm Farm-J. Willow Springs, Missouri.

ENJOY A profitable hobby at home raise New Zealand White-Rabbits sell top notch breeders at \$10 each. My folio \$50 explains everything. Buckeye Rabbits, 1711 East 82nd Street, Cleveland 3, Ohio.

INCREASE Your income, turn your spare time into cash—Making quick-selling, highly profitable lamps and fiber glass shades. Every home a prospect for one or more. Hundreds already doing it, so can you. No experience needed. No special tools required. Gearson's big, new 72 page 1954 Illustrated Catalog No. 3 will show you how, quickly. One special 8-page section shows 6 beautiful lamps in kit form, ready for you to assemble. Another 12-page section shows you how to make stunning, ultra-modern fiber glass shades, page after page filled with wide variety of other attractive shades, shade frames, figurines, and lamp bases. Also oil lamp converters, boring compound, and all kinds of cords, sockets, pipes, harps, finials, bases, and hundreds of other parts. Everything you need. And you can buy everything wholesale, sell at retail, make big profits, fast. Send only 25c right now for Gearson's big 1954 catalog and wholesale price list. Like hundreds of others, you'll be glad you did. Gearson Co., Dept. 303-B7, 27 S. Desplaines, Chicago 6, Ill.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Advertising, Apple 1, Wisconsin.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience, no capital needed. Supplies furnished. Write for free catalog. McGraw Magazine Agency, Dept. 500G, Mount Morris, Ill.

BUY Wholesale. Name brand products, 4000 items. Sell homes, organizations. Big profits. Act now, Catalog 25c. Wholesalers Mart, P.O. Box 61252H, Houston, Texas.

MAKE Extra money. Start profitable mail order business. Free information. Bruce, Box 2551, Salt Lake City, Utah.

NEW 7"-11" Ultra-blue signs. 3c, retail 50c. Sample free! Lowy, 612 Broadway, Dept. 301, New York 3.

MAKE Money at home doing easy pleasant work. Everything furnished. Good earnings. Write: West Distributors, 7 South Harlem St., Worcester, Mass.

TRIPLE Your profits. Let me write your sales letters and catalog. Advice free. Winslow, Suite 635-A, 4980 Marine Drive, Chicago 40.

FREE Folio describing "245,000; Unlimited Vacations Plan." No canvassing, mail-order, merchandise, equipment. Unknown. Works itself—home! Keep job. Haylings, Carlsbad, Calif.

START A buying service, buy wholesale thousands nationally advertised products. Make big profit selling at sizable discounts. Postcard brings details. American Buyers, 630-P, Linden, Buffalo, N. Y.

SELL Merchandise by mail from your home. Everything supplied. Big profits. Light-Way Service, 3121 N. Hamlin, Chicago 18, Ill.

NEW: Make-sell plastic plants. Look, feel real. Kit \$2.00. Marko Studios, 1133 Belmont, Chicago 13.

GET Free copy of "Opportunity," the magazine that shows you the way to unlimited profit possibilities. Gilbert, Room 1709, 28 East Jackson, Chicago 4.

DOLLARS in your mail box daily. No stock investment. Particulars free. Gem, 44-B Atlantic, Pleasantville, New Jersey.

MAIL Letters featuring real merchandise. Get \$10 orders in every mail. 100% profit. Everything furnished. Products, Box 23, Boston 17, Mass.

EARN Extra income at home. Honest, dignified, steady self-employment. Local or mailorder. Graham Company, 1236 Oranger Ave., Lakewood 7, Ohio.

PRINTING and office supplies wholesale. 20,000 items. Literature free. Royal, Box 384-A, Cleveland 27, Ohio.

CHINCHILLAS: Profitable. Raise in spare room, cellar. Terms. Ross Chinchilla Ranch, 749 Rincon, El Sobranje II, California.

GROW Mushrooms. Cellar, shed, and outdoors. Space, full time, year round. We pay \$3.50 lb. We paid Rabbit \$4.165.00 in few weeks. Free book. Washington Mushroom Ind. Dept. 17J, 2954 Admiral Way, Seattle, Washington.

SPARETIME Profits taking subscriptions. All magazines. Wholesale catalog free. Cassel Agency, Westfield 2, New Jersey.

SELL Titania gems; \$9.75 carat wholesale. More brilliant than diamonds. Free catalogue. Diamonds, 1404-M Mitchell, Oakland 1, California.

50,000 ARTICLES Wholesale. Source directory, dime. Nelko, Box 3462-DR, Chicago 54.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dense brings sample and special offer. Progressive Mailtrade, Box 351, Sheboygan, Wisconsin.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanide, Calif.

PUBLISH Your own magazine. Handsome 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Oad, Neb.

GENERAL Contest Bulletin. Issued monthly. Sample, 10c. 1609 1/2 East 5th, Duluth, Minn.

MAKE To \$1.50 hour doing common pen lettering. National Artists, 801 1/2-A North Marshall, Dallas 3, Texas.

SELL By mail Earn extra money! Informative booklet 25c. Beecher Publications, Box 2161-B, Cincinnati 1, Ohio.

FREE! Many money making offers. Boyer, 85 Uptown, Hoboken, N. J.

300% PROFIT Making and selling seamless wallets. Only scissors needed. Send \$1.00 for pattern. Burcklow, King St., Woodbury, N. J.

FREE Literature describing moneymaking mailorder plans. Lewis Bartlett, Richland, Georgia.

WINNING Prize contests is fabulous, confidential, home opportunity! Send stamp! National Contest Bulletin, Box 2685-P, Miami 16, Florida.

TYPEWRITER Owners. Make handsome profits. Get details today. Groves Company, 682, Hastings 8, Nebraska.

FORMULAS, PLANS, ETC.

LIFETIME Business! Manufacture extremely profitable products! Lists free! Thermolab, Peoria 4, Ill.

MILLER'S Modern manufacturing formulas make fast-selling products that get the business and pay! Fifty years supplying the best. Lots literature free! Liscombe Miller, Chemist, Tampa, Florida.

FORMULAS: All kinds. Latest, best. Literature free. Kemnitz, Park Ridge, Ill.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

FREE Formula catalog. Anything analyzed \$35. Western Chemical, Salem, Ore.

ANY Formula—\$3.00. Satisfaction guaranteed. Free lists. Miller, 24 Whitwell Place, Brooklyn 15, N. Y.

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SPECIAL Plastic for laminating photos, etc. Details free. Solomonson, 46 Cornhill, Boston 3, Mass.

PLASTICS Home-craft course for men and women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for free booklet. Interstate Training Service, Dept. D-3-O, Portland 13, Oregon.

PLEXIGLAS Clearcut — Masked, square foot—1/2—\$1.20, 3/4—\$1.80, 1 1/2 tubing 15c ft. List 25c. Plastics, Box 602A2, Jansenville, Wis.

EARN Big profits with Perma-Proof lifetime protection for social security cards, drivers licenses, snapshots, etc. Everybody a prospect. \$1.00 brings sales kit. Davis Plastic Company, Dept. A., Madisonville, Kentucky.

FIBERGLAS. Polyester. Plexiglas. Acetate, Vinylite. Casting, coating plastics: Fast service, best prices. Catalog—10c. Gem-O-Lite, Box 6867P, North Hollywood, California.

PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 3, Mo.

PLEXIGLAS Sheets—Cut to size. Clear. All thicknesses. Standard outdoor translucent colors. McClarin Plastics, P.O. Box 188H, Hanover, Penna.

PLEXIGLAS, Lucite. Any size sheets. Square foot (12 x 12) cost, 1/16", \$1.18; 1/8", \$1.55; 3/16", \$1.90; 1/4", \$2.25. Add 15% for postage. Minimum order \$3.00. Almac Plastics, 600 Broadway, New York City.

CHEMISTRY

"SPECTACULAR Chemical Experiments" manual, second improved printing, not mimeographed. Interesting and thorough. Contains complete formulas, set-ups, instructions, special data on thermites, fulminates, acetylides, nitrogen iodides, explosive powders, etc. Only \$1.00 postpaid. Chem-Tech Laboratories, 360CX Kelley, Buffalo 8, New York.

CHEMICAL Problems—Prompt, expert advice. Satisfaction guaranteed. Send \$3.00 per problem. S. Steiner (Consultant) Rm. 940, 121 N. Dearborn, Chicago, Ill.

SEE Cosmic rays, radio activity. New laboratory certified cloud chambers, \$8.50. Write for free specifications. Atomic Laboratory, Box 343, Berkeley, Calif.

AMAZING New book of science. Experiments, formulas and catalogue of laboratory supplies. Only 25c. National Scientific Co., Dept. PM1, 2204 W. North Ave., Chicago 47, Ill.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-plates, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 1294 West 33rd Street, New York, N. Y.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept. M-50, Biological Supply Co., 1175 Mt. Hope Ave., Rochester 20, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 25c. Tracey Laboratories, Evanston, Illinois.

AGENTS WANTED

AT Last! Something new and sensational in Christmas cards. Make extra money fast! Show sales, velours, metallics. Gets easy orders. Pays up to 100% cash profit. 30 free samples. With name. 50 for \$1.50. Big line. Amazing new glitter-belle ornaments, napkins, gifts, stationery. Several \$1.00 boxes on approval. Pure Greetings, 2001 Locust, Dept. 440-J, St. Louis, Mo.

NEW Plastic mending tape. Just press on! Repairs clothing instantly. Lightning seller. Samples sent on trial. Krister, 97, Akron, Ohio.

60% PROFIT On cosmetics—Why make less? Famous nationally advertised Studio Girl Hollywood Cosmetics pays 60%! Make \$20 day up! Hire others. Write or wire for free samples, details. Studio Girl, Glendale, Calif. Dept. PM-74.

CHRISTMAS Cards pay 75c profit on \$1.25 assortment. Exclusive 40 for \$1 name imprints; gift wraps by-the-yard; 200 new fast-sellers. Cash bonus. 5 assortments on approval. Cardinal, 1400 State, Dept. 39-K, Cincinnati 41.

100% PROFIT! Machineless plastic laminating. No experience needed! Agents in 50c. Berea Photo's, Berea, Ohio.

SELL "The Automatic Bible." Allan, 90 Coral Street, Paterson 2, N. J.

OPERATE "Escalator" mailorder system, selling our products or any products. Fastest, most revolutionary mailorder system known. Write: Babycor, Decatur 26Y, Illinois.

MAN TO earn \$150 up per week. Long needed invention. Advertised worldwide. Prospects everywhere. Full or part time. Exclusive. No investment. Free use of samples. Write Red Comet, Inc., Dept. 391-L, Littleton, Colorado.

MAKE Money fast—For yourself, church, organization. Selling friends, neighbors big value \$1.00 and \$1.25 Christmas and all occasion greeting cards. Leading 21 card boxes, religious and novelty assortments. Gift wrappings, stationery, children's items, gifts, gadgets. Deluxe imprinted Christmas cards. Over 300 items—profits to 100%. Experience unnecessary. Free gift for promptness. Bonus. Free selling plant! Samples on approval. Hedekamp, 361 Broadway, Dept. PM-23, New York.

SAVE! Make big money in sparetime. Buy nationally advertised merchandise wholesale. Catalog 25c, refundable. A Sales, 18-PM City Terrace, Newburgh, N. Y.

RUN A spare-time greeting card and gift shop at home. Show friends samples of our new 1954 Christmas and all-occasion greeting cards. Take their orders and earn up to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 40, Ferndale, Michigan.

SELL New 3-dimensional "action" Christmas, birthday, get well cards. Make \$30, \$75, \$100 extra money. Profits to 120%, plus extra cash bonus. Write for feature assortments on approval, free samples personal Christmas cards, stationery, free color catalog, selling guide. New England Art Publishers, North Abington 733-D, Mass.

MAKE \$50.00 in spare time with amazing new Presto fire extinguisher. No experience needed. Write for free sales kit. Merlite Industries, Dept. 57C, 114 East 32 St., New York 16, N. Y.

BIGGER Profits selling greeting cards. Get list of sensational factory surplus bargains. \$1.25 boxes for 50c, \$1 boxes for 35c—While they last! Big line new 1954 Christmas cards, stationery, gifts, assortments on approval, personalized samples free! Midwest Cards, 1115 Washington, Dept. G-135, St. Louis, Mo.

EXTRA Money every week. I'll send you full-size Blair household products on free trial. Show them to friends and neighbors. You can make big extra profits. Write Blair, Dept. 31MP-1, Lynchburg, Va.

APPLIANCES, Cameras, watches! Large coded wholesale catalogue! Cam Company, 606PM-20th Ave., Brooklyn 4, N. Y.

NEW Bathroom deodorizer. Hangs on wall. Banishes odors bathroom, kitchen. Lightning seller. Samples sent on trial. Krister, 97, Akron, Ohio.

MAKE Money introducing world's cutest children's dresses. Big selection, adorable styles, low prices. Complete display free. Rush name. Hartford, Dept. M-1241, Cincinnati 24, Ohio.

DESK Signs, nameplates. Free samples. Biggest profits. Whitney Signs, West Springfield, Mass.

MEN-Women! 100% profit, taking orders for Sweet Georgia Brown beauty products. Colored people buy on sight. Sample offer. Valmar, 2451-BH3 Michigan, Chicago 16.

EASY Extra income—Sell sensational new silicone starch resistant ironing board cover. Good Housekeeping approved. Terrific \$1.95 seller! Send for free complete selling kit, sample cover \$1.00. Menell Products, Dept. P-P.O. Box 431, Midtown Station, New York 18, N. Y.

BEAUTIFUL Feather pictures. 200% profit! Free sample. Apartado 9035, Mexico 1, D.F.

BLOUSES, Lingerie, hosiery, brand new line. Sensational new money making plan. Write American Mills, Dept. 423, Indianapolis.

MONEY For Xmas! Make \$50 and more during spare time. Friends, neighbors—everyone buys from Elmira's exquisite new sparkling line. Imprinted Christmas cards for as little as 3c. Personalized stationery, napkins, large gift wrappings with free accessories, ribbon ties—All fine quality money saving values. No experience needed. Send name and address for free portfolios, catalog, assortments on approval. Bonus plan. Elmira's "portable gift shop" makes money first day. Write today. Elmira Greeting Card Co., Dept. C-108, Elmira, N. Y.

AGENTS-Salesmen! Sell beautiful hand-colored plastic enlargements and sensational new personalized photo compact, rings, bracelets, lockets, etc. Experience unnecessary. 40% advance commissions. We deliver, collect. Wonderful sideline—Better full time. Free sample outfit. Novel Portrait Co., 3243 North Ave., Chicago, Ill.

HOTTEST Wholesale sellers anywhere in appliances, cameras, watches, giftware, sporting goods. Catalog free. General Wholesaler, P.O. Box 9054EF, San Francisco, Calif.

FREE Illustrations. Sterling silver neck chains and miraculous medals. \$2.75 to \$10.35 dozen. Sixteen different returnable samples \$7.50. Three samples \$1.00. Unique Chain. 473-M Hendrix, Brooklyn 7, New York.

NEW Electric light bulb kills flies, mosquitos, cockroaches. Every home needs one or more. Your profit \$1 on each. Write Alexander Sales Co., 520 Fifth Ave., New York 10, N. Y.

BUY Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, 629-P Linden, Buffalo, N. Y.

AGENTS—New revolutionary mass market safety auto accessory. Big profits. No competition. Low priced. Territories open. Parant Machine Works, 1819 Vyse Avenue, New York 80, N. Y.

BALL Pens \$10.00 gross, retractable pens \$3.50 dozen, needlebooks with threader \$8.25 gross. Lutzker, 311PM East 170th, New York City 28.

YOUR Own business—Used suits \$1.50, overcoats 65c, mackinaws 25c, shoes 22 1/2c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Moro, 1218 South Jefferson, Chicago 7.

HAVE A complete store in your pocket. Buy wholesale and make big profits. Send for free general merchandise catalog now. Jay Morris, Dept. P, 445 Broome St., New York City.

PRINTING. Advertising salesmen—Excellent moneymaking sideline selling calculators, name plates, small quantities. Automobile initials, sign letters. Free samples. Balco, XL, Boston 19, Mass.

CALIFORNIA Sweet smelling beads. Sensational sellers. Free particulars. Mission, 2328PM West Pico, Los Angeles 8, Calif.

WINDOW Sign letters. Samples free. West Coast Sign Letter Service, P.O. Box 697, Escalon, Calif.

GOLD Or silver letters, numbers. Windows, doors, trucks, 1" to 6". 500% profits. Free samples. Atlas-T, 544 West 78th, Chicago 20.

BARGAINS. Job lots, close-outs! Save up to 50% on clothing, hosiery, notions, drugs, toiletries, gifts, jewelry, television, etc. 2000 items. 25c brings wholesale bargain catalog with special get acquainted offer which includes free \$1.00 merchandise certificate. Reliable Jobbers, 311-B North Desplaines, Chicago.

\$1.00 PROFIT Selling \$2.95 photo enlargement deal. Allen Studio, Riegler Bldg., Little Rock, Ark.

MAKE Extra money. Sell front door name plates to friends, neighbors. Retail \$1.95; you make \$1.00! Free selling kit. Modern Engraving Co., P.O. Box 194, Boston 14, Mass.

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AMAZING Bath sponge. Washes back easily. Suds as it washes. Uses soap scraps. Big profit. Whirlwind seller. Write for free sample offer. Magic Products, Wollaston 70, Mass.

IT'S So terrific you'll actually sell thousands! Brand new \$2.95 pocket check protector. Sales pouring in. A tremendous deal for you. Get your town today. Federal Products, Evanston 15, Illinois.

EASY Handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

BUY Wholesale—Nationally advertised merchandise radios, appliances, cookwear, watches, jewelry, typewriters, silverware, fans, etc. Send 25c for illustrated catalogue. Box 1621, Detroit 31, Mich.

SALESMEN—DISTRIBUTORS

\$10,000 PROFIT Selling painting, matches, specialties! Arrow dealer tells how he did it in giant free sales outfit. You can do it too—without experience. Write Arrow Press, 615-R Fourth Ave. S., Minneapolis, Minn.

MAKE \$282.20 A month—Even if you take only four orders a day, for amazing new Presto-Matic defroster. Fits any refrigerator. Sells itself in seconds. Write for free sales kit. Merlite Industries, Dept. PD-71C, 114 East 32 St., New York 16.

LEARN Where millions in profits from Bible sales have gone! Receive free proven sales course and whole story of how you can get these profits! Also free catalogue of six of the world's finest Morocco grain genuine leather covered Bibles and related items! Joseph W. Cain, Wholesaler, Box 3065P, San Antonio 1, Texas.

EVERY Home, hotel, hospital wants new, sensational bathtub safety device. Prevents slipping. Make \$250 weekly easily. Rush name. SavaLife, Kessler Corporation, 385AU, Fremont, Ohio.

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ANYONE Can sell famous Hoover uniforms for beauty shops, waitresses, nurses, doctors, others. All popular miracle fabrics—Nylon, dacron, orlon. Exclusive styles, top quality. Big cash income now, real future. Equipment free. Hoover, Dept. D-100, New York 11, N. Y.

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GET Professional results every time by learning how from easy-to-understand Popular Mechanics Press title "How to Paint With Brush and Spray," \$1.50. Write Popular Mechanics, 300 E. Ontario St., Chicago 11, Ill.

CALENDARS. Advertising novelties, matches. All styles, including religious, varnished, 12 sheet, girls. Hundreds of advertising novelties, book matches, etc. Fleming Calendar Co., Sales Division, 6339 Cottage Grove, Chicago 37, Ill.

SALESMEN—Quick motor, \$100.00 week easy. Take orders electroplated and bronze colored baby shoes. Beautiful mounts. Details. Baby Shoe Novelties Sales, 5622 Angeles Vista, Los Angeles 43, Calif.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-754, 7530 Greenwood, Chicago.

AMAZING Profits for you selling Sunshine quality Christmas cards. No investment or experience necessary. Nationally famous 21 cards for \$1.00. Sell on sight! Imprints. Currier-Ives, religious, gift wraps, many others. Samples on approval, write: Sunshine Art Studios, Inc., Dept. PM-7, Springfield 1, Mass. Pasadena 3, Calif. (Note: East of Rockies address Springfield office.)

MEN! Money! Miracle Spray-A-Tint dries windshields, gives marvelous glare-protection, plus new 1954 look! Sprays on in jiffy. Reduces glare from sun, snow, headlights, etc. Lasts for years. Auto-truck owners buy on sight! Profits 100% up! Spray-A-Tint, Dept. PM-6, Consumers Bldg., Chicago 4, Illinois.

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FORTUNE Profits packaging magic "Whiter" white-side tire cleaner concentrate. Details free. Also, 3157-A Scranton, Cleveland 9, Ohio.

BIG Money-making opportunity. Exclusive line work uniforms, jackets, pants, shirts, coveralls. Advertising embroidered. Every business prospect. Outfit free. Master Div., 287 Water, Ligonier, Ind.

BIG Money now—With sensational new product that will puncture proof auto and truck tires in minutes! Amazing demonstration. Every motorist needs. Wants, buys! Write for money-making details. Everlast, Dept. B-10, Consumers Bldg., Chicago 4, Ill.

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IS \$210 A week worth a postcard to you? Then rush card with name and address for special free trial plan that sells amazing new automatic refrigerator defroster like hot cakes! Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. P-107, 173 W. Madison, Chicago 2, Illinois.

NEW Jobs open in selling. Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 14, Ill.

GOOD Man can make \$5,000 next 90 days. Every house in town wants amazing NiteLite glowing curbside numbers. Automatic free trial plan pays profits day after day. Write for free details, NILLite, 173 W. Madison, Dept. 301, Chicago 2, Ill.

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SENATIONAL Insect-O-Lite destroys insects by vaporizing chemical with heat of electric bulb. Details for \$6.95. 100% profit for agents. Insect-O-Lite Co., Cincinnati 8, Ohio.

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GIANT Gov't surplus "selling" course! 562 pages selling secrets! Big workbook included! \$1.00. Porter Surplus, 272-PM Central, Rockland, Mass.

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STARTING A business? Need help? Avoid costly pitfalls. Write Marchner Business Service, 2033 East Main St., Rochester 9, N. Y.

KEEP Out of dog house. We remember birthdays, anniversaries and shop (even Xmas) to fit budget. \$3 to \$2000. Send stamped addressed envelope and 20c. Box 221, Retail, Washington.

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FULL Size 3 line. \$1.00. Adstamp, 65 Clinic, Dayton 9, Ohio.

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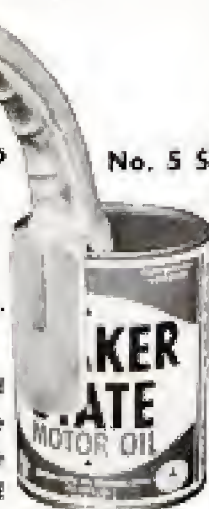
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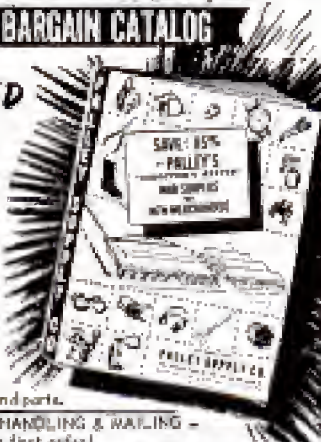
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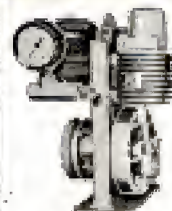


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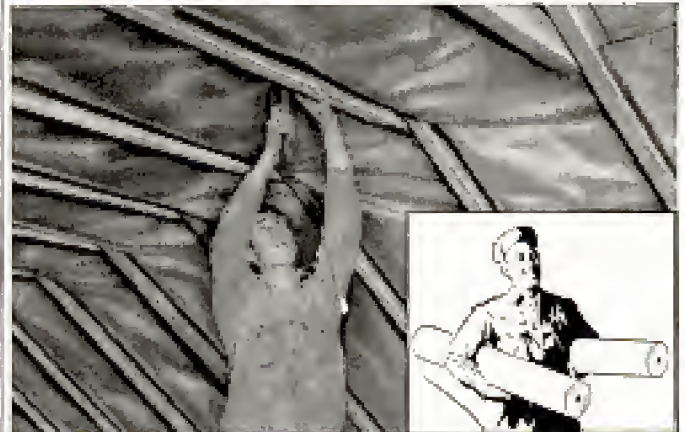
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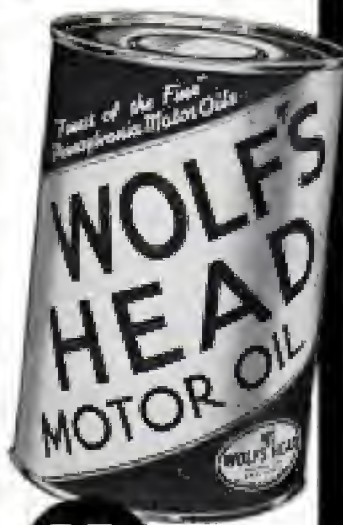
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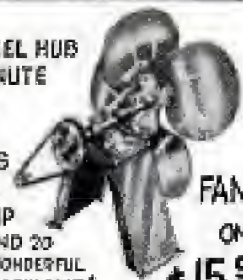
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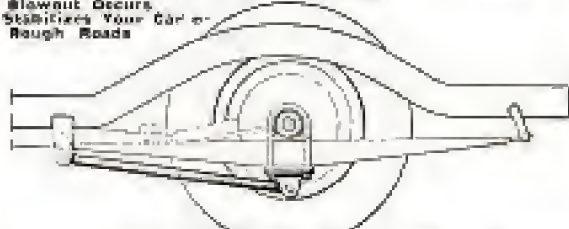


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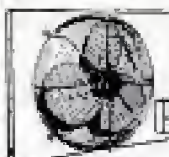
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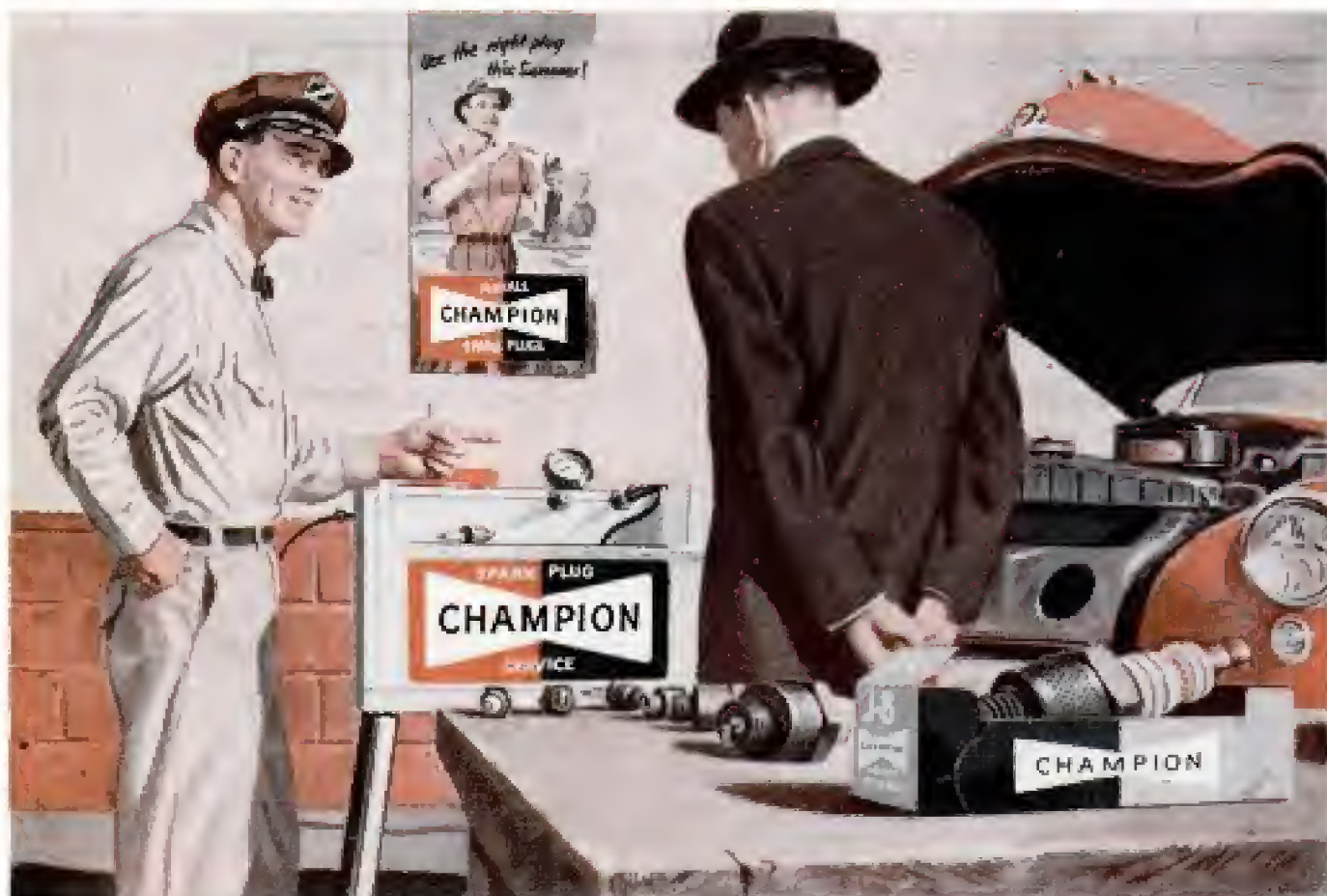
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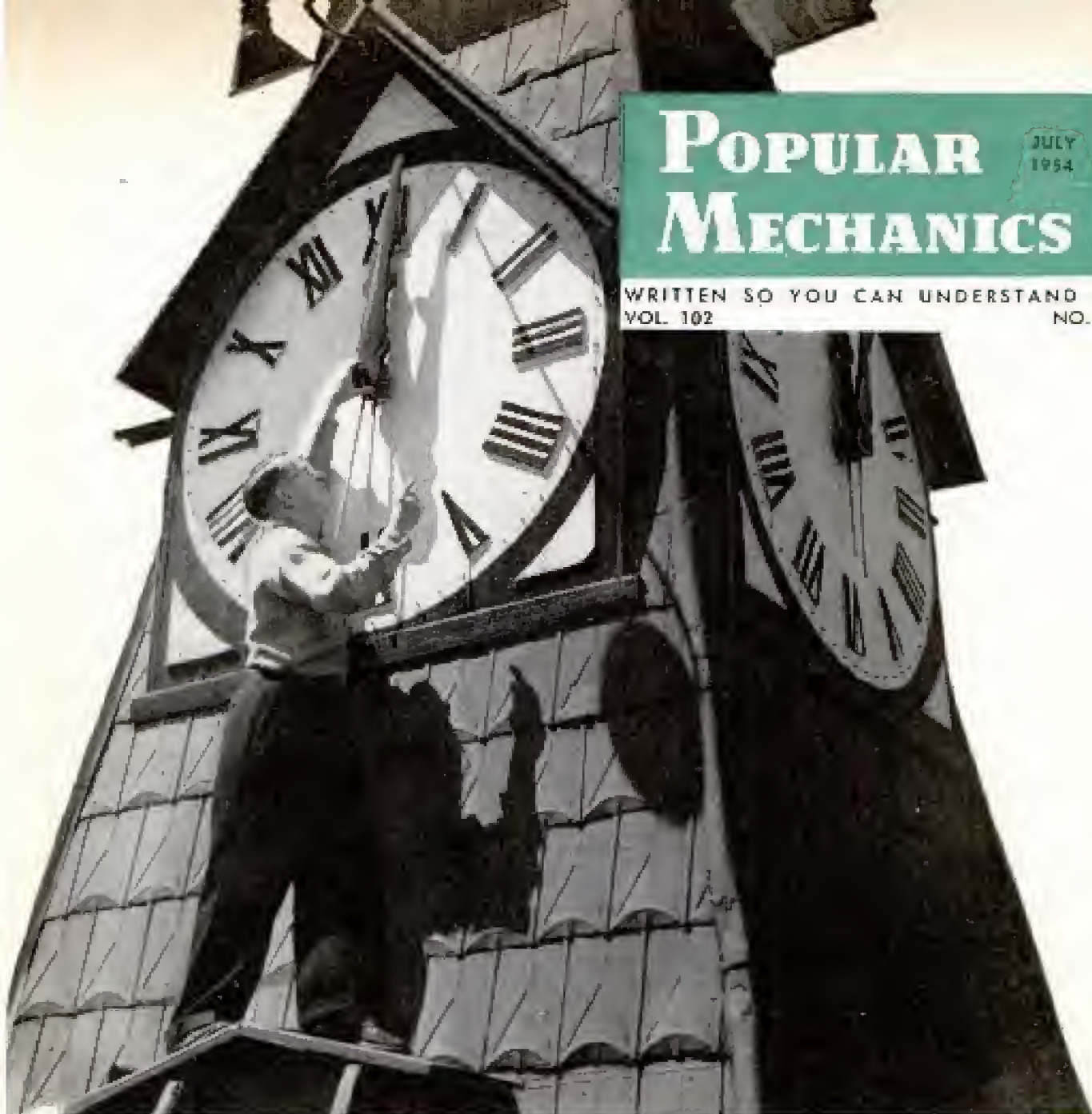


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POPULAR MECHANICS

JULY
1954

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 102 NO. 1



Working five stories above ground level, the community handyman carefully adjusts Statesville's town clock

Mr. Hamlin WILL FIX ANYTHING

By Max Tharpe

CRACKING SAFES, building cameras and guns, repairing airplanes, tricycles, town clocks or egg beaters are all in day's work for LeRoy Hamlin. He calls himself a "mechanical detective." Actually, he is the "Mr. Fixit" of Statesville, N. C. Anything that goes out of whack in Statesville is likely to become Hamlin's personal responsibility and it's a rare occasion when he is stumped.

"My job is to outsmart the Gremlins that disrupt

To a child the biggest problem in the world can be a broken tricycle. Hamlin is never too busy to fix one





Five dump trucks stood idle until Hamlin climbed out on the end of this crane to unsnarl jammed cables

Girl in a fix calls "Mr. Fixit." When she couldn't get a ring off, he cut it with inverted saw blade

Hamlin is an old hand at swapping. Here he trades one of his pistols for unborn calf from this saw





Hamlin may be called halfway across the state to open a safe which has been jammed or blasted by thieves

the machinery in our community," he points out. "Every wire, every spring has a duty to perform. When something fails, my work begins."

Rarely does Hamlin see blueprints of any of the complicated machinery he is called upon to repair. Most of his trouble shooting is accomplished by trial and error—but with uncanny success. Recently he was called out to open a safe that had been badly damaged by professional crooks who bungled a safe-blasting job. By using his methodical approach, Hamlin had the safe open in a few minutes—with a bent coat hanger! Only \$1.75 had been locked inside.

Naturally he's not telling how safes can be opened with coat hangers. "Opening any safe is purely a mechanical operation," is his only comment. He should know. Working entirely by instinct, he recently built a complete new combination lock and dial for another blasted safe.

In a medium-size town like Statesville, with 20,000 population, there are few replacement parts for many kinds of factory

or home equipment. Hamlin solves the broken-parts problem by making them himself. "This is a piston for a French motorcycle that I am working on now," he'll tell you, pointing to a casting in his basement. "How else could that boy get his motorcycle running again?"

An elaborate metal lathe is Hamlin's greatest help. He has built in modifications and attached devices to cut gears, rifle gun barrels and do almost any job a machine shop might do. One of his pet projects is turning out .22-caliber target pistols of his own design. He believes in dropping the barrel as low as possible and in making the bore slightly smaller than usual in diameter, to add greater power and accuracy through the greater pressure built up in the chamber. Hamlin takes pride in demonstrating the pistols to visitors. He can hit carpet tacks at a distance of 12 to 14 feet.

Although he has built many of his own rifles, Hamlin's gunsmith work is mostly in replacement parts for the broken rifles of



An old-time barnstorming pilot, Hamlin has no trouble fixing tail assembly of plane damaged in rough landing

neighbors. His biggest ordnance secret lies in the perfect setting of sights—a trick that has earned him a wide reputation among local hunters.

Guns seldom call for emergency repairs—but other things do. When Statesville's only bakery broke down, with its mixers full of rising dough, Hamlin had to drop everything and work through the night. He turned out the needed parts in a few hours. While making the repairs he discovered that, by making a few adjustments, he could double the speed of the bread-wrapping machinery. By the next morning the bakery was operating more efficiently than before it broke down.

Improving the things he repairs is standard Hamlin policy. When Statesville's fire-alarm system for calling out volunteers failed, Hamlin not only got it working again but speeded up its operation. Before it broke, volunteer firemen had to wait patiently to count the slow bellows of a horn that sounded like a tired cow. When Hamlin was finished, the horn sounded off the

numbers in a new code like wild geese calling.

Hamlin's early life set the stage for his handyman role. As a boy he lived near a machine shop in Mansfield, Ohio. By the time he was 16 he had built a model steam engine. His first job was running a lathe to make parts for threshing machines. By 18 he learned to fly and was an accomplished airplane mechanic. Barnstorming pilots who used his father's cow pasture at Mansfield, Ohio, trained him in exchange for his assistance in maintaining their cumbersome old biplanes.

His experience as a telegraph operator for the railroad gave Hamlin important training in electrical principles. When the first radio-broadcast stations went on the air, he began to build the bulky, earphone-equipped squealing radio receivers of that day. He became one of the earliest licensed amateur-radio operators.

A man like Hamlin was bound to invent something sooner or later. When his wife complained of an overheating iron, he set

out to solve that problem. He found that by installing a bimetallic automatic-cutoff switch in the wiring circuit, the circuit would break when excessive heat caused the contact points to expand and separate. Unfortunately, he lost legal interest in his patent rights when his backer and manufacturer died without leaving papers protecting Hamlin's interest.

A semiautomatic picture booth for making "pictures while you wait" was developed and introduced by Hamlin at the Chicago World's Fair.

During the depression years he moved his picture machines all over the country, traveling by trailer with his wife and growing family.

It was while pulling his trailer through Statesville back in 1940 that his overloaded car broke down. Before Hamlin could get the needed parts, which were two weeks in arriving, the town began to learn that he was a jack-of-all-trades. People drifted in to give him their mechanical mysteries. He liked the town and built his home there.

Hamlin still loves his work. "It's



Gremlins get into gadgets and it's part of Hamlin's job to take them out. Housewives are continually popping in with everything from egg beaters to eyeglasses and small appliances

While telephone-line crew waits, he drops other work to rush repairs on automatic cable-hanging machine

Mixing machine full of rising dough broke down in town's one bakery. He worked all night to repair it





Sportsman brings his rifle to Hamlin for emergency repairs. Hamlin's specialty is pistols, which he designs and makes himself



Photography? That's another of Hamlin's specialties. He makes the replacement parts himself. Below, a sideline business is taking "while-you-wait" photos with booth cameras of his own design



an endless adventure," he explains, "and the payoff is in the satisfaction of doing things that seem impossible."

Not all the work is as pressing as unjamming stuck elevators, or getting cranes to operate again. Hamlin is always glad to take time to help anyone with minor catastrophes. Children bring him their toys; housewives bring lamps and toasters. He's never too busy to help out anyone in trouble, from the smallest tot with a broken tricycle to a businessman with a problem that might affect hundreds of people.

"When someone brings me a mechanical 'mystery,'" says Hamlin, "my first step is to find the clues and study them. I figure out what is not performing, determine what must be done to restore the machinery—and then do it."

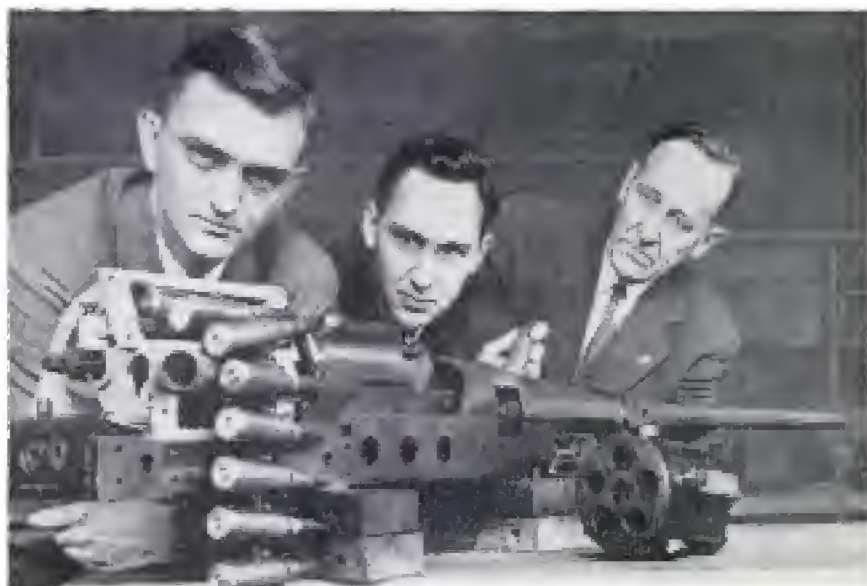
He's the best camera repairman for hundreds of miles around, and can repair electric eyes, electronic flash guns, solenoid flash trippers, shutters and other equipment. His ability along this line is a result of his years of traveling with cameras and building cameras for his own use. Hamlin will frequently make necessary camera replacement parts himself.

The real pay-off on Hamlin's concern over Statesville's problems came when he was near death following a series of chest and back operations in 1951. For weeks neighbors took care of seven of his nine children. Friends all over town helped with food and meals while Mrs. Hamlin was at his bedside. Local groups helped with the huge hospital bills.

Back in his shop, the town is running smoother again, and his reputation is spreading further. He has been making regular trips to the big Lockheed plant at Marietta, Ga., where he has been helping rig assembly lines for the B-47E Stratojet bomber and the brand-new C-130 jet transport. Today, hardly a person within miles of Statesville can say that he hasn't benefited, at least indirectly, by LeRoy Hamlin's presence. ★ ★ ★

Aircraft Cannon Fires at Record Rate of 1700 Rounds per Minute

Now in production for the Air Force is a new cannon for fighter planes which can fire shells at the record rate of 1700 rounds per minute. The gun is based on a German prototype. This weapon was modified and new models designed over a period of eight years. The final weapon, recently put into production, has a multichambered drum. A slide mechanism brings the chambers successively into alignment with the barrel. It fires 20-mm. shells or 60-cal. bullets.



Robot Pitcher Throws Small Rubber Balls for Indoor Batting Drill

Pitching small rubber balls at various speeds, a portable electric machine permits batting practice to be held indoors without

a net. Being small, the balls sharpen the batter's eye. They are soft enough so they are not dangerous. The machine throws

600 balls per hour. A regulation bat is used. The balls are about as big as ping-pong balls. Any space 20 feet long with enough width to swing a bat in is large enough. Five speed adjustments are possible, from a very fast ball to a slow floater. The machine comes in three sizes. The largest is for professional teams or schools. Smaller models are designed for amateur groups and individuals desiring bat practice.



Italy Predicts Its Gas-Turbine Auto Will Hit 155 Miles Per Hour

With an estimated top speed of 155 miles per hour, an experimental gas-turbine automobile has been tested by the Fiat Company of Italy. Under development for five years, the car has no transmission, the only foot controls being accelerator and brake. The two-stage turbine produces 200 horsepower at 22,000 revolutions per minute. Top speed to date is said to be 125 miles per hour. No suitable heat exchanger (like the regenerator in the Chrysler turbine) has been developed

by Fiat as yet and fuel consumption is twice that of a piston engine. The engine is mounted in the rear.





Insecticide Fogger for Power Mowers Uses Original Container

Lawns and shrub areas are covered with insecticide by a power-mower attachment that uses the original insecticide can as a container for the fluid. The user simply punches a hole in the bottom of the can and secures it with a spring to a platform

on the mower. The dispenser uses the engine exhaust to produce an insecticide fog in front of the mower, blanketing the average lawn in 30 minutes with a pint of fluid. Use of the original can ends breakage and corrosion problems.

Electronic Brain Will Compute Tolls on Pennsylvania Turnpike

Toll operations on the Pennsylvania Turnpike will be speeded by a combination electric-eye-and-scale "checker" at each interchange. A system of electric eyes counts the number of axles on each car or truck entering the turnpike and a scale weighs the vehicle as it is driven up to the toll booth. The whole process is automatic

and is done while the vehicle is in motion. Even when following bumper to bumper, vehicles of all sizes are processed without delay. The data is then printed on a toll card which is handed to the driver as he goes through the gate. The new system, which also will help the Turnpike's book-keeping system, will be in use by 1955.

Parachute Golf Ball Slows Practice Shots

Golfers can practice their drives in the back yard, using a golf ball that is attached to a bright-red cloth parachute. A 20-inch string connects the parachute to the regulation, long-service ball and keeps the chute out of the way while the golfer is teeing off. The parachute slows the driven ball to a safe speed and stops it quickly, preventing injury to passers-by or damage to neighbors' windows.

More iron ore was produced in the United States during 1953 than ever before—a total of 133,500,000 tons, 3,000,000 tons more than was produced in the previous record year of 1951.





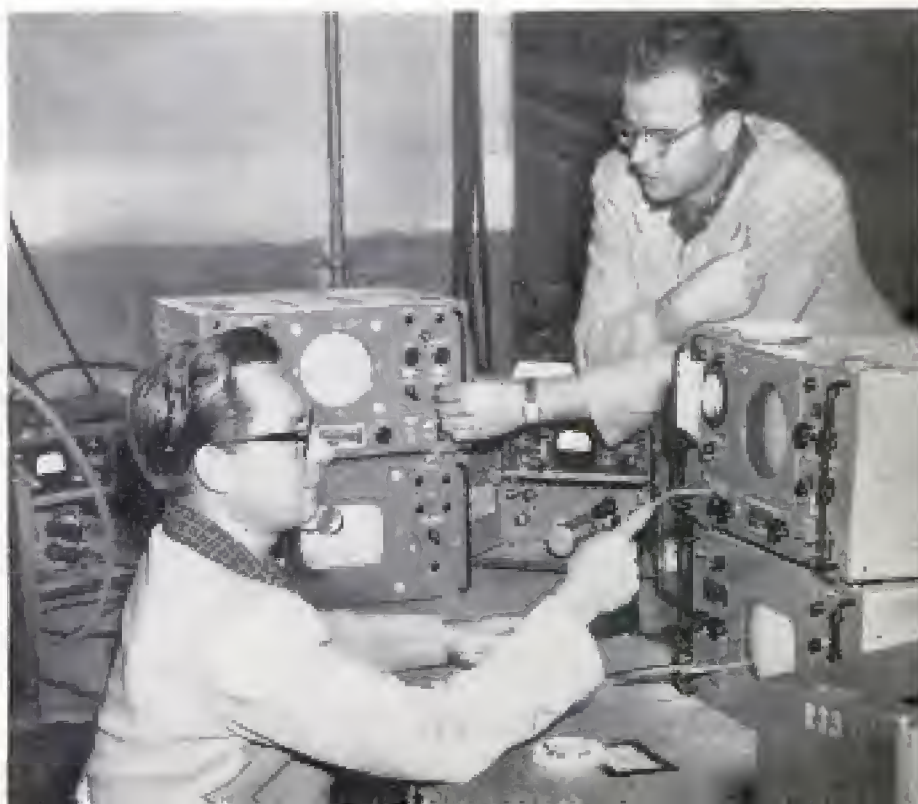
Donald O'Connor in Hollywood talks to Fredric March in New York as each watches the other on split screen

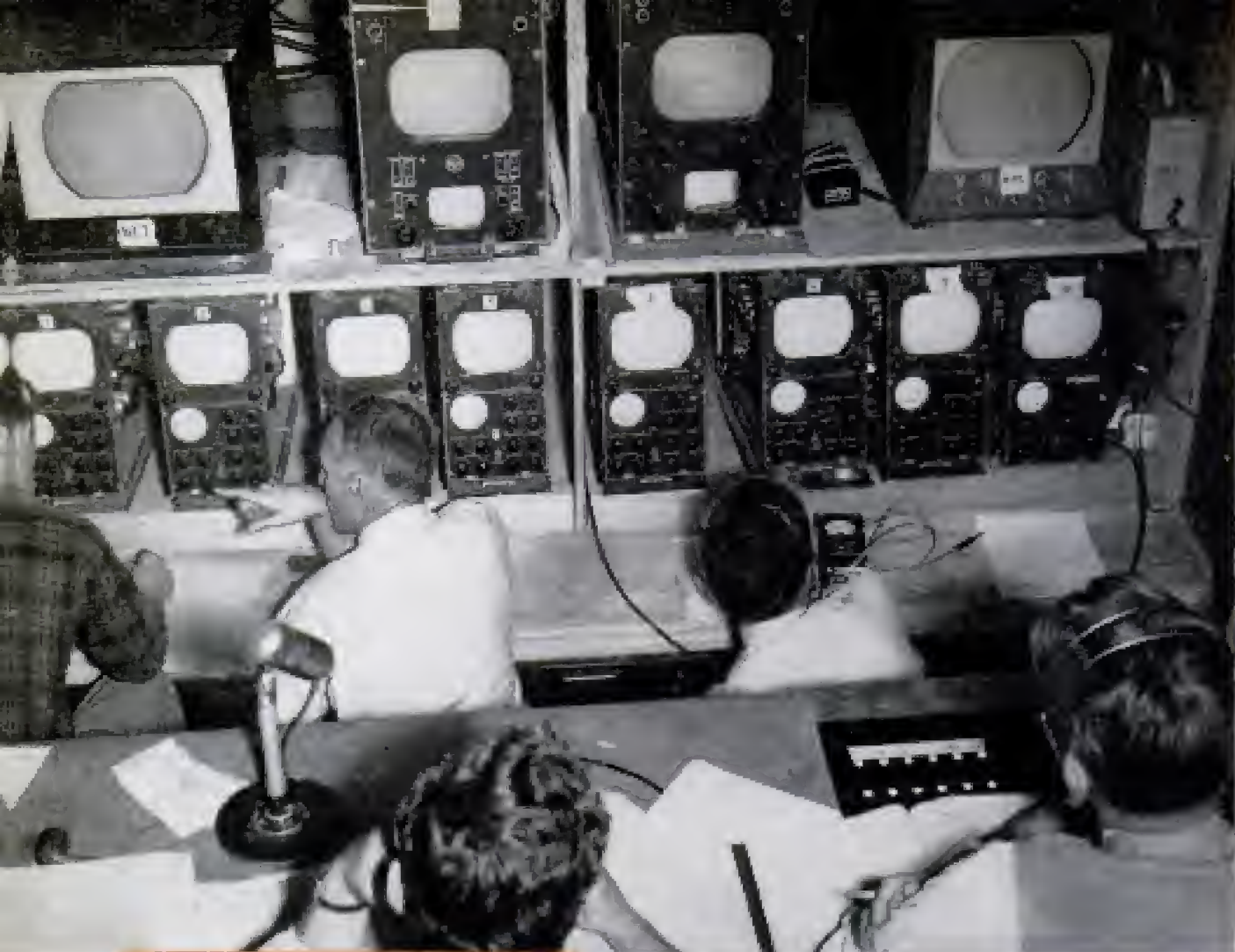
Behind the Split Screens of TV

By Jan and Bob Jensen

Engineers in telephone video-control center backstage at Pantages Theater in Hollywood make final adjustments before the telecast

IF MR. KIPLING had been sitting in the gilt-edged Hollywood audience that March evening in 1954 when the Academy of Motion Picture Arts and Sciences presented the Oscars in their 26th annual awards ceremony, he would have had to eat his words that "East is East and West is West and never the twain shall meet." They not only met, they talked to each other. On the large television-projection screen at the back of the golden bronze-draped stage, Donald O'Connor, master of ceremonies on the West Coast, was brought face to face with Frédéric March on the East Coast, and the many thousands of miles lying between their





Technical and program directors face a bank of preview and program monitors and camera-control units. A total of 24 monitors was installed backstage, in the pressroom and booths

Telephone engineer adjusts microwave reflector atop Pantages Theater in Hollywood, where the main program originated. Master-control studios were two blocks away from the theater

respective noses had been eradicated by the magic of the communications era in which they live, so that the two were presented in one picture not only to the select audience of 2800 in the Pantages Theater in Hollywood, but to millions of TV viewers throughout the nation.

No Oscar was awarded to those skilled engineers "behind the scenes," the men with the ear-phones clamped to their heads. But behind the glittering production "out front" was an unprecedented engineering extravaganza. Hollywood, Burbank, New York and Philadelphia were





Tuxedo-clad camera man atop huge crane photographs celebrities as they arrive for the Oscar presentation

linked as though under one roof for the two-hour program.

When the last golden statuette had been presented and the white ties and ermine departed from the klieg-light gleam, a tired sleepy-eyed crew of engineers, in rumpled, rented tuxedos, was left to pack up the equipment and sigh, "Well, we did it. There were no boo-boos."

It was a satisfactory feeling, after the agitated past 24 hours at the Pantages Theater, a few steps from the corner of Hollywood and Vine. No tuxedos then, but old work clothes, flannel shirts and jeans, in a bustling beehive of preparation. The only calm note was the huge replica of an Oscar standing quietly off stage center.

Workmen with coils of cables hustled back and forth. The orchestra was rehearsing repeatedly one musical phrase, "When you wish upon a star" culminating in a brilliant fanfare, over and over again, dominating the other sounds in the huge theater—the soft mutter of voices, a hammer at work, and the steady hum of the air conditioning outside the improvised television-control room backstage.

Specially built soundproof

rooms were temporary headquarters for TV and radio, with an announcer's booth, swathed in monk's-cloth draperies, tucked away in a corner with only a television monitor from which to describe the evening's events. The door to the NBC-TV booth was propped open for ventilation and, inside, busy engineers checked equipment and studied the wavering green

Engineer Bob Finch listens critically to orchestra balance at equipment which fed musical portion of program to TV and radio





Engineers keep watchful eyes on entire television production at NBC's Hollywood master-control room



Two cameras mounted on 12-foot tower in center of theater are used in shots of entire stage. Three cameras on stage were used for close-ups. Below, at Burbank studios, actor Paul Douglas awaits cue to start commercial to be inserted in Academy Awards program. Other commercials came from film studio



'scopes on the banks of field-camera control units. Paper coffee cups were strewn about their control desks. Most of these tired-looking men had averaged two hours' sleep, for only the day before had they been able to land full force in the theater. Camera and power cables had been installed a week before, but work had been limited to a few hours.

At least 30 NBC engineers were in the theater itself, with another group at the Burbank studios where commercials originated and, of course, the master-control technicians in Hollywood. In addition, there were at least a dozen audio and video telephone men working with them.

Most interesting of all in the intricate setup was a portable wipe unit, designed and built by a field engineer in four weeks' time. Inserted in the control panels, it was responsible for the difficult split-screen effect, with Hollywood on one half and New York or Philadelphia on the other, both appearing in one picture. To get the special effect, the output of the New York video circuit was fed into a high-quality 17-inch picture monitor in a booth backstage at the Pantages, the picture retelevised and fed into the mixing system and portable wipe unit, producing the split-screen result.



Television-audio engineer Bill Cole checks incoming program from New York during dress rehearsal of show

Excitement was as contagious as measles that busy morning in the dim half-light of the Pantages backstage. Somewhere a saw was whining. Telephones were ringing. The audio engineer twisted a few knobs and listened intently in his earphones. "There's still buzz on those mike lines," he said. "It's got to be ground loops. Let's put in a booster amplifier and feed high level instead of low."

They were using 16 mikes altogether, and 24 monitors had been installed in the pressrooms, announcer's booths and backstage which would be fed video and audio. The big-screen projector was installed by RCA, with special equipment to drive it in order to project a reverse picture from behind the screen, instead of from its normal position out in front. To produce such a picture, it is necessary to reverse the horizontal scanning of the projection tube. Since light energy was transmitted through the screen, it was impossible from the rear to tell if the projector was in focus, or had the proper amount of brightness and contrast. So there was a monitor in the audience manned by an engineer with a private line who literally "talked him in," telling him which knobs to turn and adjust.

Eight cameras were ready, two outside the theater and six inside. One was in the theater lobby and the other mounted on a crane across Hollywood Boulevard to televise the celebrities as they arrived. Inside, two cameras were on the tower in the center of the house. One camera on this platform had two turrets, making a total of eight lenses available instead of the usual four. They were using four Electro-

Zooms—the lens which can change from a wide shot to a close-up with a flick of a switch—and one English-designed Zoomar. Three cameras were on stage—two on pedestals and one mounted on a crane dolly.

Simultaneously, a radio broadcast of the event was being carried, using much of the same equipment and program material. In the improvised radio booth, constructed off stage left, one engineer monitored the orchestra. A feed from his equipment went to the radio engineer in the same booth, while another leg of this same feed went to the television-audio engineer who mixed it with the TV portion of the program. Similarly, a feed from the TV-audio system, with dialogue from the Pantages stage and the audio portions from New York and Philadelphia, was made back to the radio-broadcasting equipment. Another set of amplifiers, bridged from the TV equipment, fed the PA system inside and outside.

Installing the equipment was something else again. A doorway adjacent to the stage had to be removed just to bring in a camera crane and its equipment.

At least a dozen holes were drilled in the stage floor in order to get cables through to the basement before the realization came that it was a double-concrete structure. The camera cables ended up being run through the plenum chambers of the heating system. To get to the camera on the crane across Hollywood Boulevard, they had to go through the gridiron (the framework above the theater stage supporting the pulleys that raise and lower scenery), through the ventilator, across

(Continued to page 232)

You Assemble This Miniature Garden Tractor From Kit of Parts



With a new kit of parts you can assemble a miniature garden tractor for lawn mowing and rolling, grading, cultivating and removing snow. The kit includes all the parts except the engine. Any $1\frac{1}{2}$ to 3-horsepower gasoline engine can be used. The little tractor stands only 31 inches high and is $49\frac{1}{2}$ inches long, but there's a seat big enough for one adult or two children. The speed is variable from two to eight miles per hour depending upon the diameter of the engine pulley.

Sliding Tie Rings Anchored in Floor Track Secure Heavy Equipment

Outboard motors or other heavy items won't roll around the rear of a station wagon when tied down to floor tracks similar to those used on cargo aircraft. Rings that fit into the track hold the tie-down ropes securely without slipping. Each ring can be locked in position at any point along its track. The rear seat of the station wagon can be fitted to roll in the tracks. The seat can thus be secured at any desired position or reversed if necessary. Other uses of the track are for automobile-top carry-alls and for tying down heavy equipment that is shipped in over-the-road trucks.



Attachment for Portable Electric Drill Starts Gasoline Engine



You can start a gasoline engine without jerking a rope when you use a new attachment for an electric drill. The starter is designed primarily for persons with a heart condition or back trouble. One part of the attachment fits on the drill and the other part on the engine. You engage the two parts and turn on the drill to start the engine. The attachment replaces the rope starter on power mowers, garden tractors, water pumps, generators and other machines driven by gasoline engines.

☐ Originally developed as a nonskid coating for Navy ship decks, a plastic paint is available for coating stairs and floors with abrasive aluminum-oxide granules in a plastic base to increase friction.



Consolidated Valtec Aircraft Corp. photos

Supersonic Delta-Wing Interceptor Is Tested by Air Force

Supersonic speed is expected from the Air Force's new delta-wing interceptor, the F-102. Neither performance figures nor dimensions of the Convair-built craft have been announced, but it has been

under tests at Edwards Air Force Base since December. It is slated to be equipped with a Wright J-67 turbojet engine, one of the most powerful types now in operation, and is designed for all types of weather.

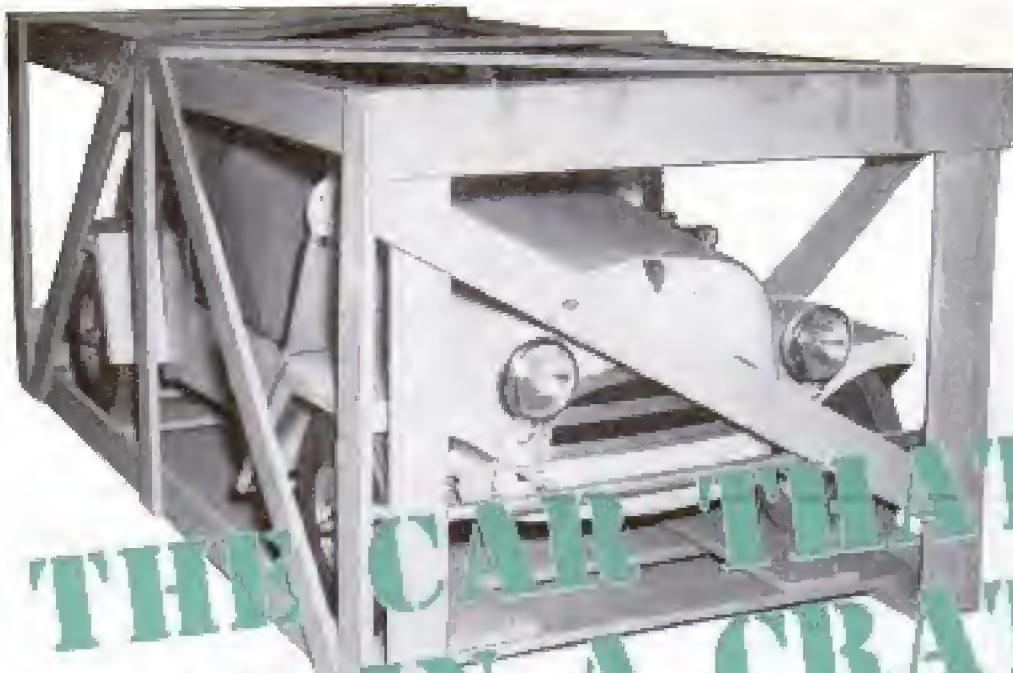
Model of USS Forrestal Gives Preview of Biggest Aircraft Carrier

Modelmakers have unveiled a miniature replica of the USS *Forrestal*, the Navy's latest and biggest aircraft carrier. It is scheduled for launching late in the fall. The fixed-island structure, the canted flight deck and the four deck elevators, three on the starboard side and one on the

portside, are shown in the model. Four catapults appear as white lines. Lining the sides of the flight deck are hinged radio antennas which swing down out of the way when the *Forrestal* is launching or retrieving planes. The canted flight deck was decided upon after the keel was laid.

Official U.S. Navy photo





THE CAR THAT COMES IN A CRATE

By Steve Libby

NEEED A NEW CAR? And a garage? You can get them both for about \$600 if you buy a King Midget, the car that comes in a crate. The crate, with siding nailed on and a peaked roof added, makes a fine garage, as some owners have discovered.

Most King Midgets, though, aren't pushed into a crate garage every night. More likely, they share a full-size garage with a full-size automobile, taking up not much more room than a power mower and a wheelbarrow.

What is the King Midget? Many persons

have never seen one although it has been in production since 1946. Today there are several thousand Midgets in use all over the world.

The small car is the result of an idea of two Athens, Ohio, men—Dale Orcutt and Claude Dry. After the war, they started experimenting with a lightweight car based on airplane-type construction. They hand-built nine test models and then moved into an old motor-scooter factory to make the new car in earnest. For a while the manufacture of two-wheel motor scooters paid

King Midget chassis, showing perforated side members and location of the air-cooled, one-cylinder engine





Despite its size, the King Midget isn't afraid of hard work. Here it tows a small speedboat and trailer

the bills, but soon the King Midget became the breadwinner.

With a 72-inch wheelbase, the King Midget is about two inches wider and six inches shorter than the Crosley (no longer in production). It is of all-steel construction, with frame members being formed of aircraft tubing and perforated channeling for strength and light weight.

Top speed is about 50 miles per hour. Driving the car is simplicity itself. There is no foot clutch. To go forward, you merely put the shift lever in Drive and step on the throttle. The only foot controls are a brake pedal and an accelerator. De luxe models have an automatic transmission with two speeds forward. Standard models

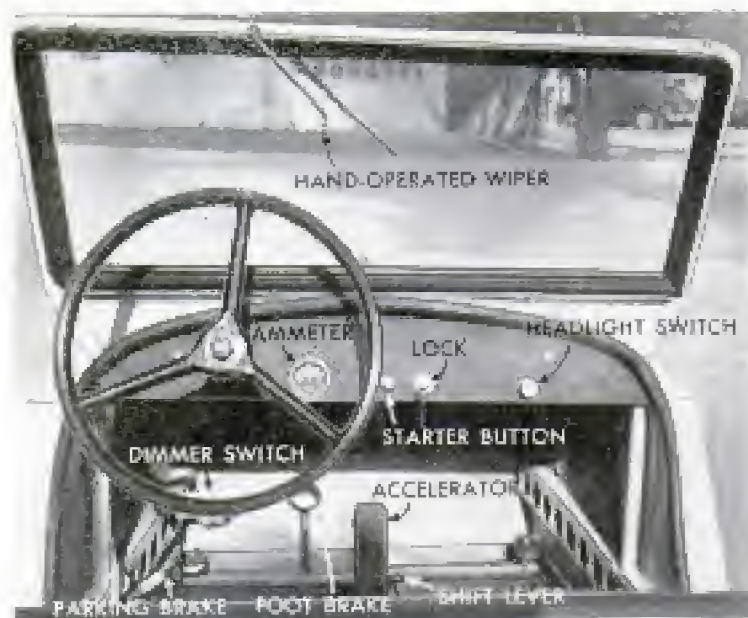
have only one gear ratio for forward speed. It has a reverse gear, of course.

What does it cost? The basic price is about \$560, complete and ready to drive. You can pay as much as \$700 for one, if you want such extra-cost items as the automatic transmission, electric starter or a nonstandard color that adds \$10 to the bill (standard color is described as a "rich cream" by the manufacturers).

The King Midget is chain driven and uses 5½-inch tires, little more than 18 inches high. One finger can turn the steering wheel even with the car standing still. The car turns around inside an 11-foot circle. Brakes are internal expanding and on the rear wheels only. Because most of the

At famed Cypress Gardens, the tiny cars drive down to the water's edge. If one gets stuck, it is picked up!





Don't look for luxury or fancy styling inside the car (or outside either). Labels show the various controls used by the driver. The only foot pedals are accelerator and brake pedals, plus the dimmer switch. Horn button, not visible, is on dash



No sissy, the tiny car shown above made the trip from Michigan to Mexico and back with two persons and luggage aboard. Below, you can buy a Midget as a kit and assemble it yourself, but it saves only about \$20. Almost all of them are sold assembled



weight is there (it being a rear-engine car), braking efficiency is equal to that of a four-wheel-brake car.

Its one-cylinder, air-cooled Wisconsin engine weighs about 75 pounds dry; the whole car weighs 550 pounds. Without the extra-cost electric starter, you turn over the engine with a rope pull, similar to that on an outboard motor. Being air cooled, the engine has no radiator and no cooling problem, even in hottest weather (King Midgets are in use in almost every country in the world, including hot climates as in Saudi Arabia).

The car passes safety requirements of all states, having safety-glass windshield, sealed-beam headlights, stoplight, electric horn, windshield wipers (hand operated) and a high brake efficiency.

With its rear engine, the King Midget has traction under almost all conditions. If it should get stuck, you can pick up the front end yourself or with the help of another person pick up the rear end or with three others you can pick up the whole thing and carry it to firmer ground!

Yet it is no toy, having plenty of durability and "muscle" built into it. One owner drove from Michigan to Mexico and back with a passenger, baggage and camping equipment aboard. Total weight of the load was much more than the weight of the unladen car. It would be the equivalent of taking a long trip in a normal-size car loaded with more than two tons of passengers and luggage!

King Midgets go from 50 to 65 miles on a gallon of gasoline. Three pints of oil fill the engine.

The top is semiconvertible—it does not fold, but can be removed. It has no trunk, the engine filling the rear compartment. There is room for two suitcases behind the driver's seat. The space under the hood is filled by legs.

Because of its original design, the King Midget has many unusual ideas. For example, the stoplight switch is simply a pressure switch on the face of the brake pedal. When you step on the brake, you close the switch, turning on the stoplight. Altogether, there are over 60 patents granted or pending on various features of the car that comes in a crate. ★ ★ ★



Electric chair is designed specifically for going up and down stairs. Attendant is needed to steady it



Curb-stepping wheel chair easily climbs over small obstructions when center tail wheel is retracted

Motorized Wheel Chairs Step Over Curbs and Climb Stairs

Two inventors—Ove Hauschild of Copenhagen, Denmark, and R. E. Church of Elkin, N. C.—have similar ideas about giving the wheel-chair patient more mobility. The Danish invention is an electric stair-climbing chair. Three small wheels connected by a vee belt rotate around each end of the axle. The chair will go up or down the steepest stairs, although an attendant is needed to steady the device. The

American vehicle is powered by a two-horsepower gasoline engine and enables the operator to ride over curbs, climb steep grades and negotiate two or three steps at a time—all without outside aid. On each side, a large wheel at the front is connected to a small rear wheel by a vee belt. In normal-travel position the vehicle rides on the two main wheels and a center tail wheel which turns for steering.

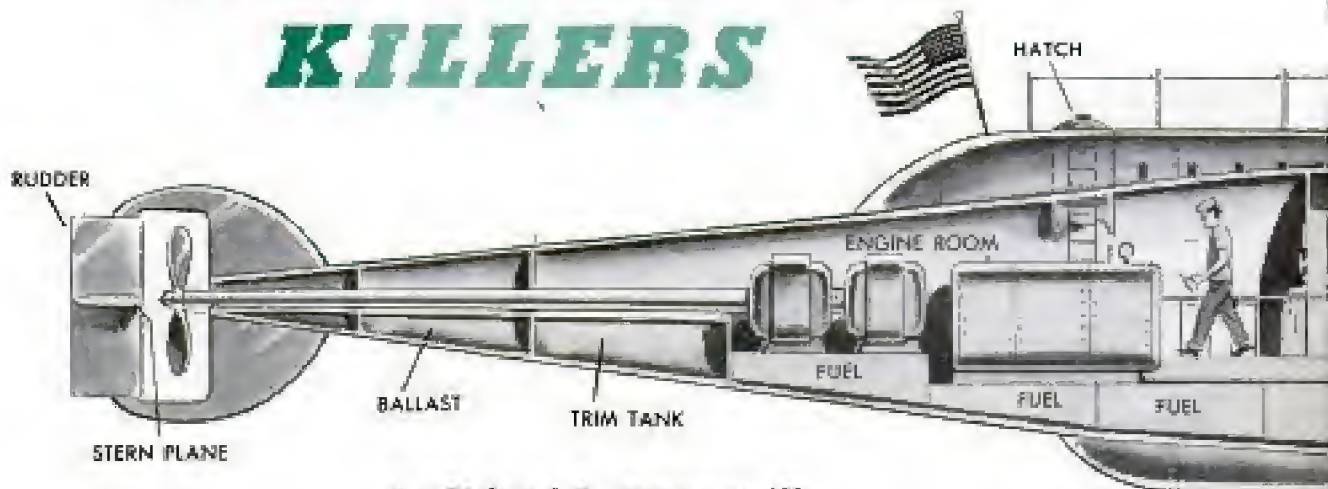
Fresh-Air Gymnasium for Texas School Open on Two Main Sides

Children at a new Corpus Christi, Tex., school will get plenty of fresh air and sunshine when they're exercising in a unique open gymnasium. The gymnasium court is completely open on two sides, because out-

door play is possible 96 percent of the school year. A curved roof which rests on a supporting wall and one end of the gymnasium locker building protects the court from rain and direct sunshine.



MIDGET SUBS PLAY TARGET FOR KILLERS



By Richard F. Dempewolff

FANCY BALL SUGAR, this is Hambrook George. . . We will use grenades on the next three runs. . . Stand by to mark center."

The cryptic message on the underwater phone meant we were about to be "depth charged" with grenades. Fancy Ball Sugar was our code name in a cat-and-mouse game between destroyer and submarine. Hambrook George was the leader of a three-destroyer-escort task force whose mission for the day was to "scratch one submarine"—us.

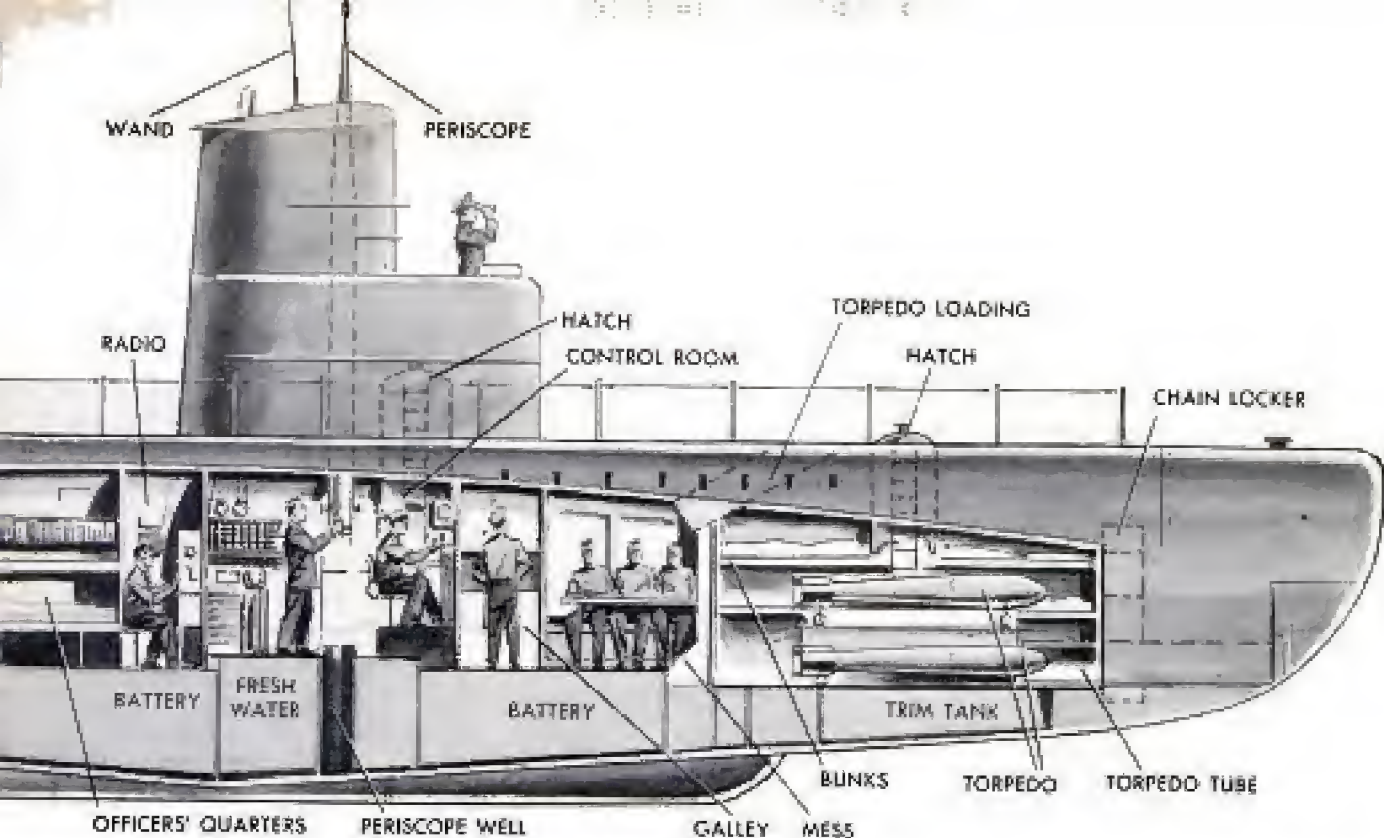
Fluorescent light glinted off myriad dials in the cramped control room of the brand-new midget submarine T-2, as she fishtailed evasively through the midnight-blue Gulf water. We crept along at three knots. Our depth needle wavered at 110 feet under the

hand of the helmsman, sitting at a radically new joy-stick control by which he "flew" the sub like an airplane. Lt. Edward Holt, captain of the unique craft, sat hunched before the window of the sonar screen, watching a cathode ray shoot green graphs of light across the range grid. Through his earphones, and over the loudspeaker connected with the sonar, the grating sound of a destroyer escort's whirring propeller overhead grew louder and louder, scraping the silence. The "pip" on the screen showed he had our range, was bearing down fast.

"Mark center!" A voice from the ship upstairs boomed over the underwater phone speaker. An instant later, an ear-splitting crack ricocheted through the jam-packed spaces of the baby sub with the noise impact of a 60-mm. cannon.

Three-hundred-foot fleet sub in background dwarfs T-2, which is 131 feet from bow to tip of its submerged tail





"Vent one thousand," somebody muttered. "We're dead."

"Vent one thousand," is seagoing vernacular for "sub sunk," and if that grenade had been a depth charge, we would have been dead. Lt. Holt was already making his report to the DE (destroyer escort): "... one zero yards dead ahead my bow ... good shot."

Although the grenades were "local color" especially for my benefit, there was nothing simulated about the rest of this business. Every man involved was deadly serious. The work is part of a vast Navy program designed to train surface crews in the vital business of locating, running down and destroying enemy submarines, using a frightening array of complex electronic

A push forward on the joy stick points the sub down, a pull brings her up. Wheel at top steers the rudder

gear that does everything but talk. Submariners learn evasive tactics and, in some mock battles, strike back at the surface forces with dummy torpedoes.

The T-boats, T-1 and T-2 (T stands for "target trainer"), are the newest tools in the program and, it's hoped, will prove how easy or tough it is for a sub to elude the "hound dog" tactics of surface anti-sub forces. Fresh off the General Dynamics Corporation's ways in New London, Conn. last year, they have been winning their spurs the hard way at the Navy's Key West Base ever since.

T-boats are smaller than any U.S. sub that has slid down the ways since the "B-class" boats of 1907. Two jumps would carry you across the T-2's 13-foot beam. Walk

Bow planes regulate pitch of sub's dive and retract into hull when not in use. Joy stick controls them





Operations over, the midget sub sails home. Captain Holt and his exec ride the conning tower as sailors rig lines for docking. Below, Holt checks location of DE on sonar screen as it passes over and drops "charge," tells skipper if he was close enough for hit



down the lean deck and you soon run out of ship. She's only 131 feet (a fleet sub is about 300 feet) from rakish bow to the weir guards surrounding her single screw—and nearly a third of her over-all length is just a tunnel for the shaft. It never clears the surface. But the housing for her rudder humps out of the water some thirty feet aft, so that when she's underway she looks like a mother whale followed by a pup. Her pint-size conning tower is wide enough so you have to be a tightrope walker to squeeze past it.

It takes 14 men and two officers—or a fifth the number for a big sub—to run a T-boat, and it's a good thing it doesn't take more. The spaces below deck are crammed with a plumber's nightmare of gleaming steel gear, meters, dials, levers and switches. Two main bulkheads divide the hull into three compartments. Up in the bow, men sack in with the torpedoes. Bunks fit between and atop the "fish" with, as one man puts it, "snoring clearance of about three inches." There's even a bunk on the single torpedo tube, which is the T-2's only weapon. Two steps take you through the hatch to the crew's mess—a short narrow shelf from which four thin men can eat, once they've learned to do it with elbows pinned to their hips. Behind them, E. T. "Frenchie" LeFevre, the ship's cook and most popular crew member, serves up rare fare of frog legs, lobster tails, shrimp and other nonregulation morale-boosting dishes, in a galley that measures a full two by three feet. Frenchie's built-in coffee urn is overhead. But his freeze locker, which takes up most of the area in this space, will stock enough provisions to keep his eager customers supplied with full meals for 20 days at sea, and on lean rations for another 10.

Midship compartment on the T-2 houses the control room, radio shack and just about the smallest officers' quarters in the Navy. Here, Capt. Holt and his executive officer, Lt. (jg) McQuilling—both six-footers—jackknife themselves into five-foot bunks, which they have to make up themselves each morning since there's no place on board to stow such luxuries as a steward.

The midget's twin diesels that spin the generators to charge the batteries which, in turn, drive the big electric motor that turns the screw, are squeezed in the long tubular compartment at the after end of the boat. A compact arrangement of batteries fill the round belly of the sub. The four main-ballast tanks, for diving her, circle up inside her pressure hull. Every inch is utilized.

"For training in peacetime, and possible coastal and harbor work in war, she's a

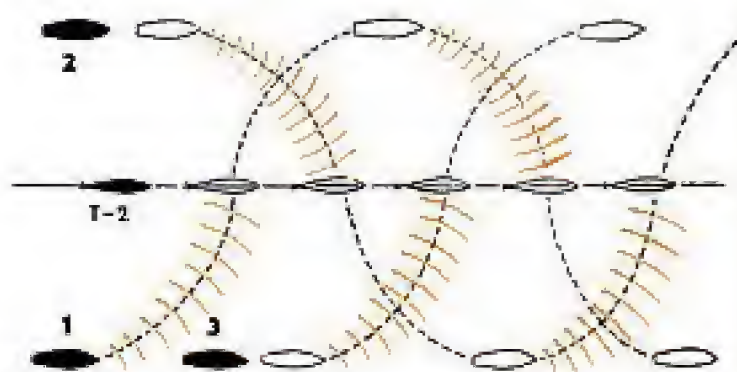


Destroyer escort 218 is leader of the surface task force of three DEs out to "kill" the midget submarine

nifty little boat," says Captain Holt. "Mass produced, she'd cost a fraction of a large sub, and is remarkably economical to run. The fuel tanks hold 5500 gallons, against the 105,000 gallons in a fleet-type sub, and she'll go 2000 miles on them. While her top speed of 10 knots will never break records, she can spin around on a dime. She rides a sea better than a big sub, because the small bow rides with it. She's lively in the water. Because of her size, she's mighty hard to find. She's so splinter thin that if we run her bow-on or stern-on toward any destroyer bent on her destruction, she won't give any more sonar return than a fish on their ranging scopes."

You're not on board the T-2 long before you realize that her 14-man crew is unusual. There's an air of efficient informality that Capt. Holt compares with a baseball team. "Every man," he explains, "knows how to play every other man's position." You may find Frenchie, still wearing his "cook's hat," taking his trick as "pilot" on the joy stick after the frog legs are cleaned up. Chief of the boat, John Ott, is officially first-class radioman in charge of communications. But he may be found on deck heaving lines when T-2 gets underway, down below on the hydraulic manifold during diving or surfacing operations, or relaying orders from the exec in the control room.

With such a small crew, there can't be any pure specialists. If one man is laid up another must fill in. Everyone on a T-boat is a T-boat enthusiast. He has to be. "She's a working son-of-a-gun," one of the men explains. "Four hours sleep in every 24 is a good average, and there's not much room for time off." Actually every T-boat man is a double volunteer—first he had to volunteer for sub duty; then he had to

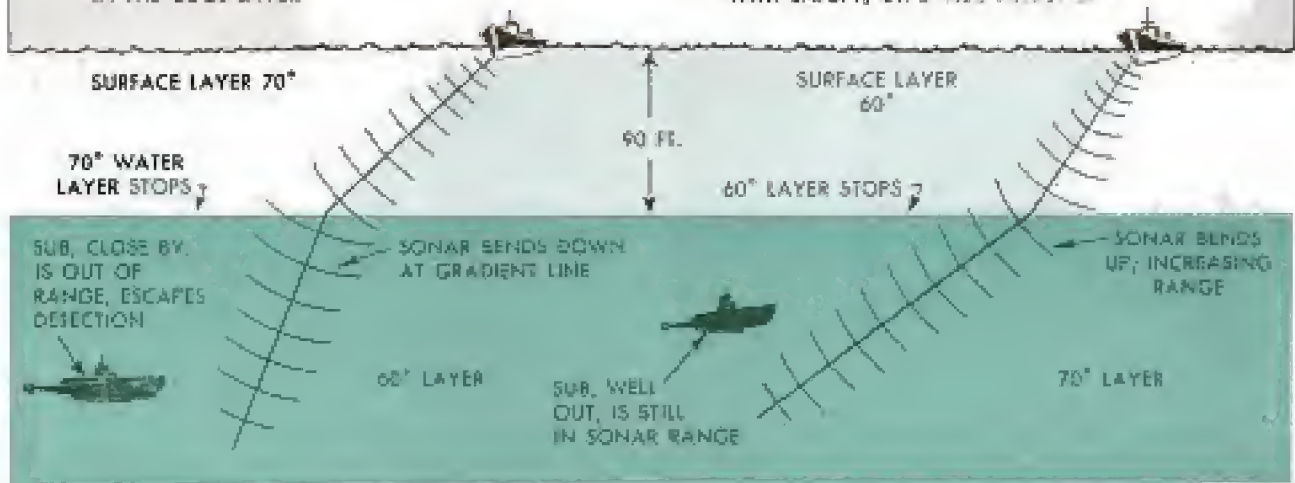


Sketch shows how surface ships make runs on midget sub T-2. Below, rocket-propelled "hedgehog" depth charges are launched singly, in series or all at once



NEGATIVE GRADIENT IN OCEAN TEMPERATURE IS A CONDITION WHERE AT A CERTAIN DEPTH, TEMPERATURE SUDDENLY DROPS. IT BENDS SONAR BEAM DOWN, SO SUB CAN HIDE IN THE COOL LAYER.

POSITIVE GRADIENT SURFACE WATER OF COOL TEMPERATURE OVERLAYS A WARM LAYER, AND SONAR BEAMS BEND UPWARD, INCREASING RANGE. SUB SKIPPERS DON'T LIKE IT, SINCE THEY CAN'T COME IN CLOSE WITH SAFETY, OR EVADE DETECTION



Range of sonar detection equipment often depends upon presence of warm or cool layers that bend beams

volunteer again for service on T-boats.

Despite her cramped spaces, there are no short cuts in the business end of the T-2. All her working equipment from periscope and snorkel to air conditioning is standard. Her sonar, radar and radio gear are the same as on any big sub. In time of war, Holt thinks she could do a fine patrol or harbor defense job—at a fraction of the cost of a fleet-type boat.

To watch her in operation on a problem exercise is an experience in peak coordination. T-2's day starts at dawn. Lines are heaved, and off she goes out the Key West channel to take up duty as underwater clay pigeon for the three "enemy" DEs that will spend the day making runs on her. From now on, T-2 is "Fancy Ball Sugar" on the communication frequencies. The lead surface ship, DE 218, is Hambrook George, and the midget will take orders from its skipper, Lt. Cmdr. Jackson Morton. Plowing the blue water behind 218 come "Daphne Tare" and "Forfeit Fox," two more destroyer escorts. The fun starts when the ships reach their assigned area.

In the 10-by-10 confines of T-2's control room, every man is at station when orders blare over the radio from Hambrook George to commence the exercise.

"Straight board—pressure in the boat," snaps the exec. T-2's siren blares. A horn like the Klaxon on a 1910 car blasts through the spaces.

The chief of the watch, manning the hydraulic manifold, moves like greased lightning. He flips a lever that claps the main induction hatch shut with a crack like a .45 fired into an empty steel drum. One hand turns a valve to secure the snorkel; the other throws switches that secure remaining hatches. On the lighted panel in

front of him, red "Os" indicating open holes blink out and are replaced by a "straight board" of red dashes. The boat is secure.

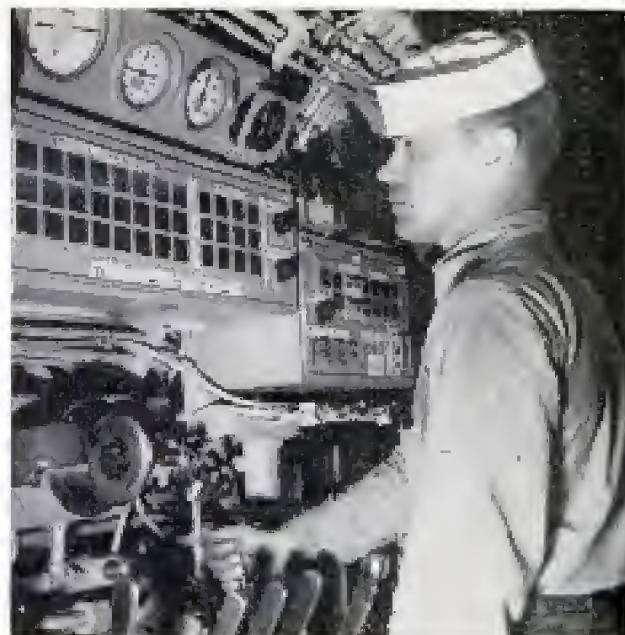
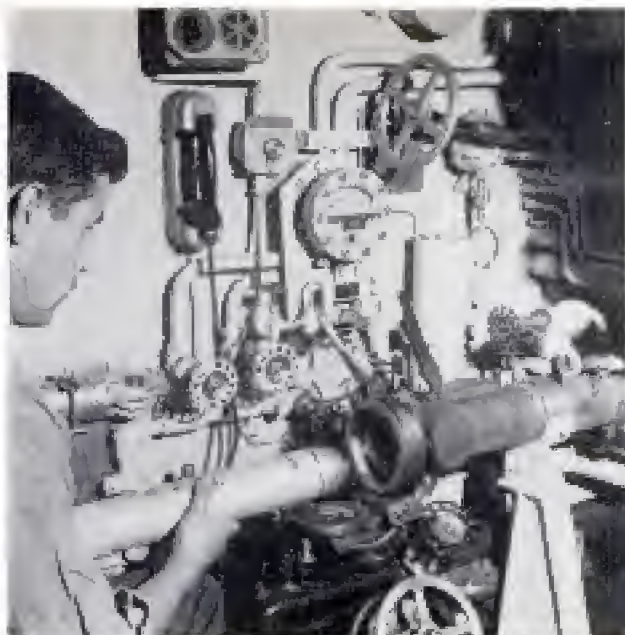
"Submerge to 30 feet," comes the order from McQuilling.

Bang! bang! bang! bang! The sharp crack of solenoids ramming home echo down the compartments as the craft is vented and sea water gushes into the ballast tanks. Silence shrouds the boat as diesels cut out and battery power surges to the soundless motors. At 30 feet (periscope depth), the order comes to "zero bubble," or level her off for a final check. Vents slam shut. The midget steadies in the water as Captain Holt ups periscope for a last look around.

Diving-officer McQuilling scans the instruments. At a signal from the skipper he gives the final diving order: "Hundred and ten feet, five degrees—down bubble."

In his seat behind the tricky joy stick, the "pilot" flips the switch that rigs bow diving planes. T-2's deck tilts forward and down she goes to working depth. No other sub has bow planes like the T-boats. When secured, they fit in slots, completely hidden from view under the deck. When "rigged," they hinge forward out of the slots at a down angle for instant dive. By pushing his stick forward, the helmsman can increase the angle on the planes. By pulling back, he reverses them and the sub "flies" up through the water. Turning the wheel atop the joy stick steers the rudder. On most submarines, three men at three different controls handle the chores that a T-boat helmsman can do alone.

A hundred and ten feet was our working depth the day T-2 performed for *Popular Mechanics*. Down below our course was set, the boat was trimmed, and off we went on a five-hour hounds-and-hares chase.



Signal flare projectile goes into ejector. Chief Qtr, right, regulates ballast and closes hatches with hydraulics

On the surface, three DEs line up for the "kill"—two on one side, one on the other, crossing our track in turn, dropping imaginary charges and calling for accuracy reports.

At the sonar scope, Captain Holt watches their approach, listens for their "mark center" call at the point they choose to drop their imaginary depth charges and reports hits and misses over the underwater phone. The gobbledy-gook chatter, mixed with the sound of whirring propellers overhead, sounds like talk between space ships: "Fancy Ball Sugar, this is Forfeit Fox" . . . (pause) . . . "MARK CENTER!"

Noting the location of the pip made by the DE on the sonar range screen at the instant of "mark center," Holt reports his "death" or escape: "Forfeit Fox, this is Fancy Ball Sugar . . . Your closest approach—one, zero, zero. At mark center, fo-fer, zero, zero yards." Up on Forfeit Fox's bridge, sonar students huddle to find why their aim was off, as the ship goes to the end of the line for another try.

In this hunt-and-kill business, subs may try evasive tactics, as we did that day—fishtailing down the course. They may also carry sonar students, and fire back at their attackers with dummy torpedoes. Although the T-boats are equipped to do this, and will, they haven't tried yet. But most of the men on board have played in such games on fleet-type subs. Sometimes, the competition gets keen enough so that both sides will fudge on enemy "hits," reporting a near miss instead. Arguments ring over the underwater phone.

But during more elaborate exercises, in which weapons are used, it's not easy to cheat. At "mark center," the surface ship fires a pattern of rocket-type charges,

called hedgehogs. The bristling launcher is designed to send them arching out over the water, spread thin like buckshot from a shotgun and bracket the sub. Each is smeared with dye to stain the water where it enters. At "mark center," the sub must release a bubble from her oxygen banks, or a flare from her ejector tube.

"Subs can't fudge on that system," says Lt. Cmdr. Morton of DE 218. "We can see where the bombs went in and where the flare or bubble comes up. Sometimes a bubble will boil right up through a patch of dye. When it does, we call it 'Roger, slug, zero' which means—scratch one sub. Fifty yards away would be 'Roger, slug, five,' and so on."

There have been some amusing episodes with the flares. A flare is a five-pound, shell-shaped device about 18 inches long. It is fired from the sub's ejector tube, bounds to the surface, explodes like a July 4th aerial bomb and sends a colored flare sailing skyward. On the way down, a tiny parachute opens and drops the flare slowly into the sea. Like any sub, T-2 carries three kinds: yellow means "preparing to surface"; green means "torpedo fired"; red means "sub in distress." Green is used in the exercises.

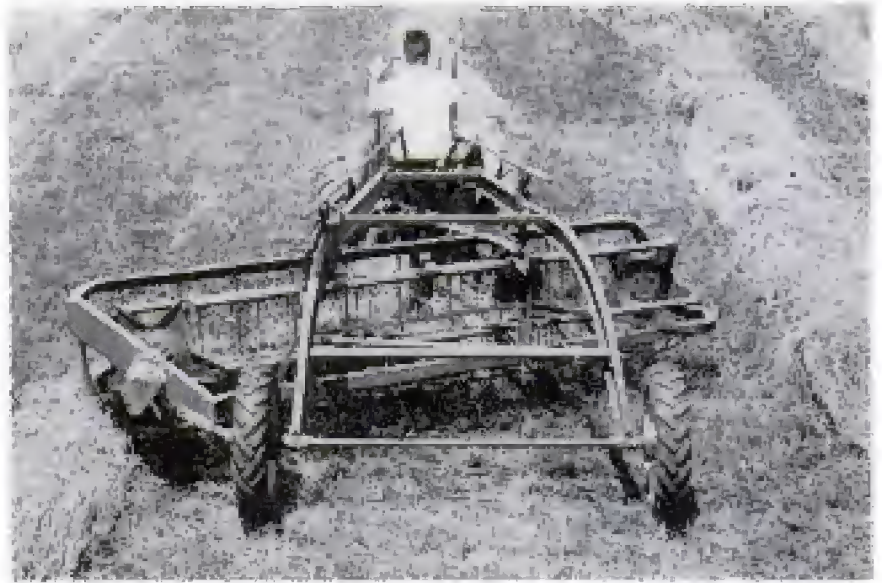
"We landed one right on the deck of an attacking destroyer," Holt recalls. "And one day, we even managed to send one sailing up to hit a blimp that was flying in low, trying to make a sneak attack on us."

Excitement runs at a high pitch during the double-edged battles between destroyer and sub. One fleet-sub skipper was so intent on "getting" his attacker one day, that he broached (surfaced) right under the ship, rolled over and lost a good-size chunk

(Continued to page 240)

Rake "Pampers" Hay to Prevent Loss of Protein-Filled Leaves

Hay gathered by a new side rake is "babied" so it loses fewer of its leaves. The leaves are important to livestock diet because in legume hay about 75 percent of the protein is in the leaves. The new rake has five bars on the raking reel and moves the hay almost at right angles to the direction of travel. This reduces the forward motion of the hay, causing less damage. The angle of the tines can be adjusted to make a tight windrow for silage or a fluffy one for baling.



Scientists Finally Find Long-Sought "Ghost" Particle Inside Atom

At last scientists have trapped an atomic "ghost" particle that has eluded them for years. The particle is the neutrino. The chase began 20 years ago when scientists were forced to acknowledge the existence of the particle if their atomic theories were correct. Neutrinos are so small that they

have practically no mass or electric charge. No direct evidence of the neutrino was found until the Los Alamos Scientific Laboratory devised a scintillation counter that was thousands of times more sensitive than any other device to reactions caused by neutrinos.

Rotary Garden Sprayer Throws an Eight-Foot Stream of Dust



With a miniature rotary duster, gardeners can hurl a stream of dust eight feet long to reach bushes ordinarily inaccessible to them. The little duster weighs only 24 ounces yet it will hold enough dust to cover 200 rose bushes. Turning the handle generates an air stream which carries the dust.

Improved Transistors Resist Heat and Air

Transistors made from a "stabilized germanium" resist their two worst enemies—heat and air. As a result, the electronic devices can be used for military equipment like radar and for commercial electronic computers. An alloy of 98 percent germanium and 2 percent silicon, treated in molten potassium cyanide, has been found by Sylvania engineers to be "quite successful" in resisting heat. Some alloys of germanium and silicon will operate at 350 degrees Fahrenheit, they say. Germanium crystals usually don't amplify above 212 degrees Fahrenheit.



Most fatal accidents involve clear weather, a straight road, a car in good condition PLUS too much speed

The State of Washington is getting tough with killers on the highway. Its advice to drivers is simple:

SLOW DOWN AND LIVE LONGER

By Rafe Gibbs

WHAT ARE POLICE in your community doing to protect you from death on the highway? Are they tough enough—to keep you alive?

Last fall, Gov. Arthur B. Langlie of Washington got tough. "Kill a man with a gun and we call it murder," he told the public. "Run him down with a two-ton steel machine and we call it an accident. . . . I am determined to use every means at my command to repel this killer."

In his intense campaign aimed at cutting the traffic fatality toll in half, he ordered into action radar and radio equipment, electric timing devices, disguised patrol cars with a minimum of police identification and plain-clothes officers.

Arrests for traffic violations in the state

shot up 70 percent. The lives saved? The goal was almost achieved. In 1952, the traffic fatalities for the last two months totaled 134; in 1953, 78.

Throughout the State of Washington today are men, women and children who got an extension on their lives simply because their police got tough.

It was a rain-soaked night on Highway 99—"Fatality Alley"—between Seattle and Tacoma. A state-police car roared down the wet pavement. The speedometer needle nudged up to 90, then moved to 93.

Finally the police car had closed in enough on its quarry for the sergeant at the wheel to turn on the siren. The screaming sound brought a 1946-model light sedan to a slithering stop.

On facing page, a Washington policeman follows a suspected traffic violator, the "trafficamera" (upper left) recording the whole scene as he drives past



Frame from a film taken by the trafficamera shows car passing a truck and going 52 miles per hour. The camera automatically records the time and date also

The sergeant turned on the spotlight and, as he moved toward the sedan, its hatless driver got out, staggered and demanded:

"What's the beef?"

"Speeding—and I guess driving while under the influence, too. How many drinks have you had tonight?"

"A few—six or seven. How should I know? I'm not drunk. Just a little dizzy. And I wasn't speeding."

"Before I took after you, you clocked with radar at 85 in a 50-mile zone, and..."

"Radar... say, that ain't legal."

When Governor Langlie's traffic war got underway there was much argument as to whether the use of radar was legal.

The radar unit used in checking traffic consists of a transmitter in a small black box—about the size of an automobile battery case. The box, set in the rear end of a parked patrol car, sends out a beam through an opaque plastic window. This beam, held on a passing car, bounces back, and a calibrating dial, connected to the transmitter, registers the vehicle's speed.

The radar units, which cost about \$1000 each, are now being utilized in varying degrees by more than half the states. Some states, such as Oklahoma which has big "Radar Enforced Speed Limit" signs posted beside "Welcome to Oklahoma" signs on all highways leading into the state, make no bones about the use of radar. Other states, because of legal complications or criticism, have radar on an "experimental" basis.

Washington, with an antispeed-trap law, had not used radar until Governor Langlie declared war on speeders. As various prosecutors in Washington pressed for a decision on the legality of radar sleuthing,

the governor asked his attorney general for a ruling. It was his opinion that radar was not a speed-trap device and, because there was no chance of human error, its evidence could be used in court.

Added State Patrol Sgt. E. J. Loerch, one of the officers in charge of radar work: "The device is accurate within two miles in computing speeds."

Washington's first radar patrol was established on the opening day of the traffic war at a school crossing on the Seattle-Tacoma highway. A patrolman sat in the back seat of a parked police car, watching a gauge. As a car passed, he said:

"Thirty-one miles per hour. Eleven over the limit."

Another officer in the front seat flipped a microphone switch and broadcast a description of the speeding car. Several hundred yards ahead, as the speeding car passed, a patrol car swung into the highway behind it and turned on the red light. The arrest was made... as simple as that.

Particularly effective among the modern weapons ordered into use by Governor Langlie in Washington's traffic war were the airborne ones—not in trapping speeders, but in deterring them. At first, a big helicopter was used to hover over the main highways spoked to the hub of busy Seattle. But this proved expensive to operate for long periods and the State Patrol later turned primarily to light aircraft of the Washington Air National Guard.

The aircraft were equipped with two-way radio in contact with patrol cars.

"We spotted few speeders from the air," said Captain Clinton Johnson of the Guard. "The plane overhead just naturally kept



the drivers below within speed limits. But what we did see were cars following others too closely, motorists squirreling or hogging a lane or maybe slowing up a lot of traffic and getting other drivers impatient. We radioed the patrol cars and they took over from there."

Probably the most frequent violation noted — and a dangerous one, particularly on slippery highways—was that of following too closely.

Then there were the patrol cars without the familiar white sides. Langlie's terse announcement that these were to be used stirred up some protest—until it was explained that there would be no question in the mind of a motorist as to who was stop-

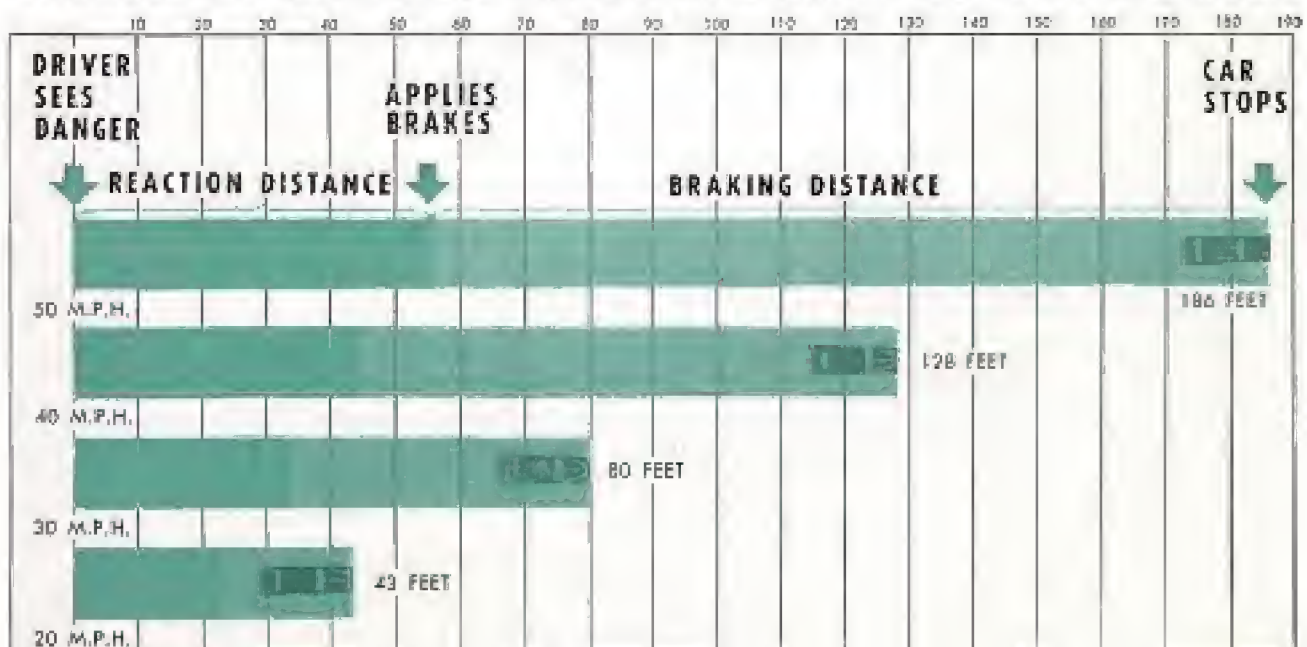
ping him even before he was flagged down.

Bearing down on traffic violators were blue, green or brown sedans — even two-toned jobs. And sometimes the police in them were in plain clothes. But the cars carried sirens concealed under hoods, had red blinker lights and license plates with the unmistakable police "SX."

A patrolman picked up a driver weaving erratically through traffic at high speeds. The driver, who admitted drinking "10 or 15 glasses of beer," had a drunkometer reading of .207, with .150 generally considered evidence of intoxication. His explanation to the judge, who fined him \$100 and revoked his driver's license for a year:

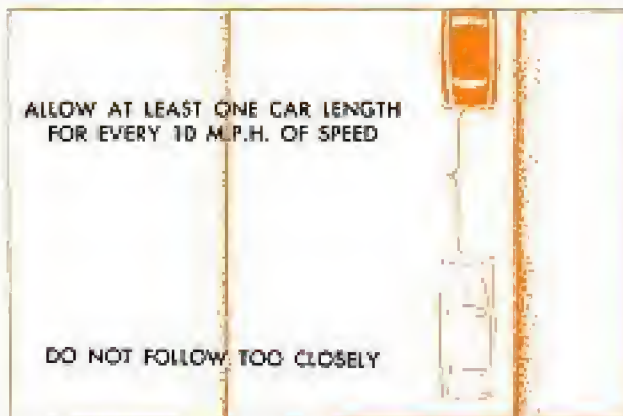
"I thought the officer's car behind me

Today's speeds don't permit fast stops. Chart shows distance required to stop from even moderate speeds





Washington uses aircraft to police roads in heavy-traffic periods. Violations are radioed to patrol cars



Speedometer of the radar unit gives the speed of approaching cars. A second car picks up violators



was some of my friends from the tavern I had just left. I was only showing off for their benefit."

And what was the public reaction in Washington to the traffic war? When police action gets so tough it can reach out and grab even you, you are not inclined to like it—unless you can see direct benefits for you. And it is difficult to prove that it is your life that is being saved by tough police action.

But an odd thing happened. Fast-driving motorists forced to take it easier on the highway, liked the slower pace. With the more orderly flow of traffic, there was less starting and stopping, less driver strain.

One Olympia-to-Seattle commuter found that he had to get up 15 minutes earlier to make the trip.

"But now I am enjoying the ride," he said. "Before I was a bundle of nerves."

As the campaign went into 1954, it did so with the use of a newly developed state "trafficamera" patrol car. With a 35-millimeter camera mounted on the car's windshield, the patrolman takes still shots or movies of violators in cars ahead. Automatically recorded on the film are the time and speed of travel. Pictures taken are used as evidence in court or for educational and training purposes.

In the United States today, someone is injured every 24 seconds in a motor-vehicle accident, someone is killed every 14 minutes. If the police in your community are not tough enough—and your support is needed to make them tough—you may have only 14 minutes to live. ★ ★ ★

TRADITIONAL summer doldrums that settle over the auto industry in July usually mark the end of the spring-summer sales season.

Dealers have found that each year most new models and a vast percentage of used cars are sold before the American public takes its summer vacation.

While things may be quieting down in the hinterlands, Detroit is buzzing as the industry works feverishly on patterns, tools, dies, jigs and fixtures for next year's cars. The manufacturing end of the business is in a literal sweat to meet ever-closer deadlines. Competition has not ended for the year, it is intensified by the pressure to get the 1955 models ready.

The sales race between Chevrolet and Ford will be interrupted only long enough for a "pit stop" to make new-model changes. This race dominated the industry during the first half of the year.

Chevrolet and Ford will come whizzing out of the pits in completely new cars. Plymouth, which fell behind this year, hopes to regain third place by entering the race with its redesigned 1955 models earlier than its rivals—although word persists at Chrysler Corporation that the new models won't be out until late December or early January.

Spies Are Working Overtime

Busier than ever is each company's "fifth column" that spies on the new models and reports the details to competition. These well-organized informants (without which no company would think of operating) are now known as "G-2" instead of by the more offensive term, "spies." Considering the vast number of blueprints that passes through so many hands in the mass-production schedule, it is amazing how little information gets out to the public.

But what has become common, well-founded gossip, is that Chevrolet and Pontiac will introduce completely new models with new engines (V8s, of course), new body shells, new ornamentation, panoramic windshields and mechanical improvements. They will have even more extensive changes than were made on the 1954 Cadillac, Buick and Oldsmobile lines.

All Chrysler's passenger-car models—Chrysler, DeSoto, Dodge and Plymouth—will be redesigned and restyled with panoramic windshields. The windshield wrap-around reportedly will be most pronounced on the Chrysler and more modified on the DeSoto, Dodge and Plymouth, sources say. While the tooling costs are secret, early estimates exceed \$130,000,000 for the four Chrysler lines.

Plymouth's new V8 engine (said to develop 135 horsepower and to be a small



Dodge V8 without the hemispheric combustion chamber) and the body changes will get a big play in the ads.

Ford, too, will have a completely new model in 1955 with an improved V8 engine. Some engineers believe that the Mercury V8 (modified, of course) will be the power plant in the 1955 Ford and a more powerful V8 will be put in the Mercury.

Packard's V8 Engine

Behind the main tent, Packard has been making tremendous strides in its two-year rejuvenation program. Its 1955 models will also have the panoramic windshield and extensive appearance changes. And its new V8 engine is rumored to fulfill Packard's reputation as an outstanding engine maker. Another rumor is that it will be made available to other independents in a consolidation-to-cut-costs program outside the Big Three. Financial interests are trying to bring about a merger of Packard and Studebaker, one source reports.

Production of Ford's Thunderbird sports convertible is expected to precede announcement of the 1955 standard models. Mercury, which did well with sales during the first half of 1954, is expected to mass-produce the XM-800—its dream car.

The popularity of the Chevrolet Nomad, the low-silhouette Corvette station wagon which won so much attention at Motorama showings, has encouraged stylists and engineers alike to take serious notice of its design possibilities. Some even say that this type of body may succeed the hardtop convertible in popularity.

Sliding doors, instead of the conventional hinged type, are due for increased use in sports-type cars. Like several other ideas introduced by Kaiser (such as tail-lights in rear-fender fins), sliding doors were first shown in the Kaiser Darrin.

By the way, Chrysler now lists Sonotone's nickel-cadmium battery as optional equipment (\$100). See *PM* March 1954 for details about this battery that lasts from 10 to 15 years. ★ ★ ★



Two-foot depth allows shallow diving by small children. Air from vacuum cleaner, above, inflates liner. Installing the pool, left, requires no tools and little time. Protective bumper overhangs circular side wall of wooden stakes that upholds pool

57-Pound Plastic Bathing Pool Holds 1600 Gallons of Water

You don't have to dig a pit for a backyard bathing pool that's two feet deep, 12 feet in diameter and holds 1600 gallons of water. It sits right on top of the lawn. The sides of the circular pool are upheld by a

wooden fence. The plastic pool with its vinyl lining and protective bumper is inflated with a vacuum cleaner after it is placed over the side walls. Weight of the deflated pool is only 57 pounds.

Steel-Drum Swimming Raft Quickly Assembled



Welded-steel understructure gives raft rigidity and long life. The raft fills need of camps, resorts, vacationers

One man can quickly set up a steel-drum raft that is shipped disassembled. The raft deck is of thick, warp-resistant construction with white canvas molded to it. Safety features include rounded edges, splinter-free surfaces and a welded-steel grab rail. One or more ladders are firmly attached to the corners, which has a welded-steel understructure. The raft is made in four-by-eight-foot sections, each containing four drums for proper buoyancy.



Industrial Forestry Association photo

Here the old enemy is encircled and a lumber-company forester stands watch as it slowly burns itself out

Television spots the blaze in the pine woods, walkie-talkies direct the attack. The new strategy in tinder-dry timberland makes

EVERY MAN A FOREST-FIRE FIGHTER

By Tom Riley

QUIETLY, A TREMENDOUS revolution is going on in our forest lands. Throughout the fire season each recent year, from April into November, there has been a rush of activity in the woods as never before. A constantly increasing army of workers armed with better methods and better equipment (including television) is engaged in a knockdown fight against that ancient enemy—fire.

Despite the fact that more people are visiting the forest lands every year, there has been a steady decrease in forest-fire damage. One of the reasons for this is that

an informed public is more careful of its campfires and cigarettes than in the past. Other important factors are the many improvements in fire-fighting methods.

The newest and most exciting development in spotting forest fires—the use of remotely controlled television cameras in lookout towers—is now being tried out by the Louisiana Forestry Commission. They call it “detecto-vision.” An industrial-type television camera in a Plexiglas dome is mounted on top of a tower. The camera rotates continuously, scanning the treetops exactly as a towerman does but in a more

deliberate manner. It also sees more because it is equipped with a telephoto lens and can pick up a cow munching grass four miles away. Fires have been spotted as far as 20 miles from the camera.

Azimuth markings are located on the dome so the TV camera picks up the degree readings at the same time as it scans the landscape. A special bifocal lens makes it possible to read the close-up numbers on the dome. Microwaves transmit the images to a television set 50 miles away. Remotely controlled cameras installed in several towers with one central-control station manned by a single operator could "cover" a large area, technicians believe. A television receiving set for each of the cameras would be located in the central station. By reading the azimuth bearing on a fire off two sets, the operator could immediately ascertain its exact position.

While the nation's forest-fire fighters are watching the Louisiana experiments with intense interest, legions of tin-hatted "youngsters" continue to patrol vast timber areas. Grizzled old stump ranchers out West are astounded at the number of patrols, especially in regions where formerly more than one man in ten miles was considered a crowd. But the old-timers admit the youngsters are winning the fight.

The chances are that any new lookout tower you see straddling a mountaintop this summer will be manned by a state ranger or company tree-farm employee. In many cases the tower will be festooned with VHF antennas because the logger and his associates today have the largest industrial radio network of the nation. Also, that tanklike contraption feeding a flickering torch in a mountain meadow is not a misplaced welding torch, but a silver-iodide rain maker in an experiment of wrenching rain from summer clouds for a dry forest "farm." The civilian fire fighters are trying

Gasoline "speeder" is used to transport men to work on logging railroad and also serves to patrol the tracks every day during the fire season



This typical tree-farm lookout station in Washington is manned continuously during the fire months

everything. That bright red pickup truck you meet when trout fishing is not a fuel truck for a near-by logging show; it's one of the logging outfit's fire-patrol vehicles, constantly roaming the forest-protection roads. The plain fact is that the federal forest ranger no longer stands alone in the protection of our forests. He is, and gladly, becoming but one cog in a much larger machine. Our Forest Service has been doing a good job of protecting the national forests for five decades, but that land is all it does protect. Approximately 75 percent of the forest land of this nation is owned by farmers, ranchers and forest-products industries. Other great acreages are owned by states, counties and city water bureaus. In all that timber, usually handier to populated areas than the national forests, is where most forest fires occur.

Formerly, there seemed no way to guard against fire, because the cost of protecting private timber year after year was too



Bulldozer goes in to strengthen fire line along road at scene of cedar ground fire on tree farm in Idaho

high. Today, one simple idea has changed the picture completely—tree farms. Since 1941, lumbermen, other forest owners and farmers have been investing heavily in tree farms, with the idea of having a perpetual timber crop by raising new trees as the old are being cut and by replanting denuded stumplands of the past. "As a result," as one lumberman puts it, "we've just had to provide better fire protection—everywhere." The stakes have become bigger. West Coast lumbermen alone are shooting at a sustained-yield program on their growing tree farms that make the 1849 gold rush just peanuts.

Nice thing about it is that the loggers, tree farmers and local government are teaming closely together to perpetuate their vast and intermingled timber holdings—and thus are perpetuating truly huge vacation areas for America. You'll find lumber companies today that are building attractive roadside campgrounds for tourists in beautiful forested areas of their tree farms, for the same reason Forest Service campgrounds were made, to give choice camps at locations where the fire danger can be kept to a minimum. Some tree farmers are even hauling hunters into their timberlands, using their trucks because the roads are impassable to ordinary cars. They charge nothing, ask only in return that the

Tree-farm workers take a breather beside portable fire pump which sucks water from pond in Northwest





Weyerhaeuser Company photo

Diesel engines are used on logging railroads because the fire danger is less than with a steam locomotive

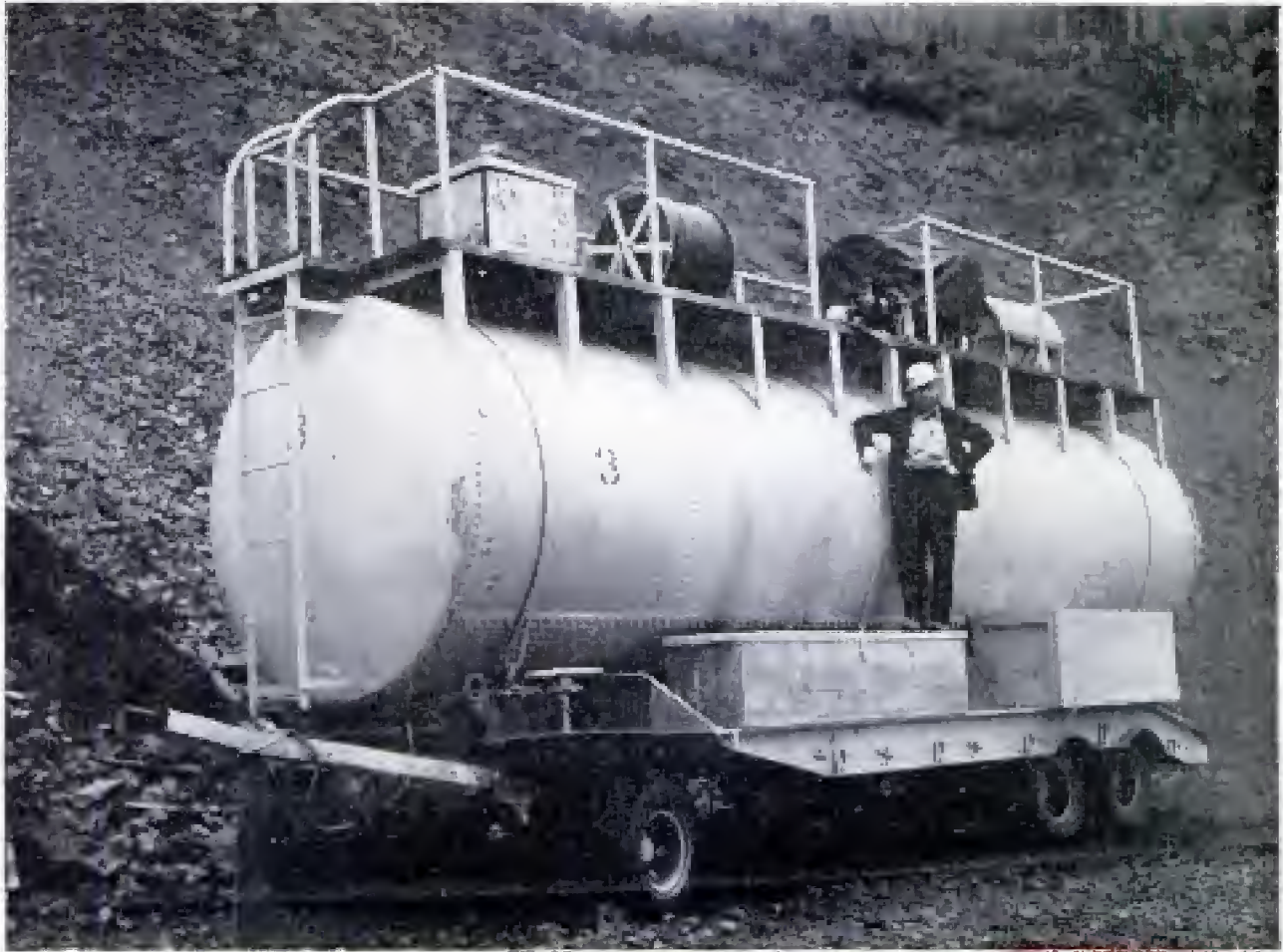
Roadside sign along highway on Oregon coast gives fire-danger conditions to motorists near big forest



hunters be careful with their campfires and matches. The cooperation has paid off.

One of the biggest things in this all-out, everybody's fight against forest fire is the use of VHF radio. In Oregon, for instance, say a logging crew is working a side far back in the Cascade Mountains. Deep in a timbered canyon, this crew could be completely isolated from the rest of the world. However, the foreman of practically every woods crew has a portable walkie-talkie with him today. If vehicles can get to the spot, he will have a larger VHF receiver-transmitter in his pickup truck. If the crew in the canyon spots a fire they cannot handle alone, they radio immediately for help from other loggers and the state forestry department. If the lookout in any tower in the region spots smoke, he will call in to a district dispatcher of a state-wide fire-radio network who, in turn, will immediately have an experienced logging crew out to control the fire. The logging crews are subject to fire-call at any time.

Today's loggers have also become weathermen. Any fair-sized logging operation now maintains a portable weather station. Each day a member of the crew daintily twirls the tiny fan of a psychrometer—to check the all-important relative humidity. The minute the humidity drops to the fire-danger point (30 percent in the Pacific Northwest), the logging operation shuts down completely until the humidity rises.



Weyerhaeuser Company photo

Tree farms keep huge water tankers handy in areas where water holes are scarce. This one holds 8000 gallons

Fire-weather forecasts of the U. S. Weather Bureau are sent out on the forest-radio system, so that loggers and tree farmers will also know what to expect tomorrow.

Other methods of communications are constantly being tried by the timbermen. It is hard for an outsider to realize how little a person can see when in the deep woods engulfed in cubic miles of smoke. Light airplanes are used to patrol areas not covered by lookout towers. When a forest fire is raging, these planes not only radio information to the walkie-talkies scattered along the fire line but some, equipped with powerful loudspeakers under the wings, swoop down to blare instructions and information to every man below. Another aerial method successfully used in Idaho is a flying darkroom. A plane equipped with a portable darkroom takes aerial photos of the fire, develops them while circling above and drops prints to the men below so they will know what is going on—both before them and over the next mountain.

How do they fight a forest fire? Most of the battles are simple in plan, rough in effort. For a smouldering, lightning-hit snag, a man or two hikes in to fall it and then douse it with water from a back-pack pump. On a larger fire, the men go in to make a fire line at or ahead of the fire. First, they cut down all trees and brush

Standard fire pump mounted on pack board is used as portable unit and is attached to a power-saw motor





Louisiana Forestry Commission photo

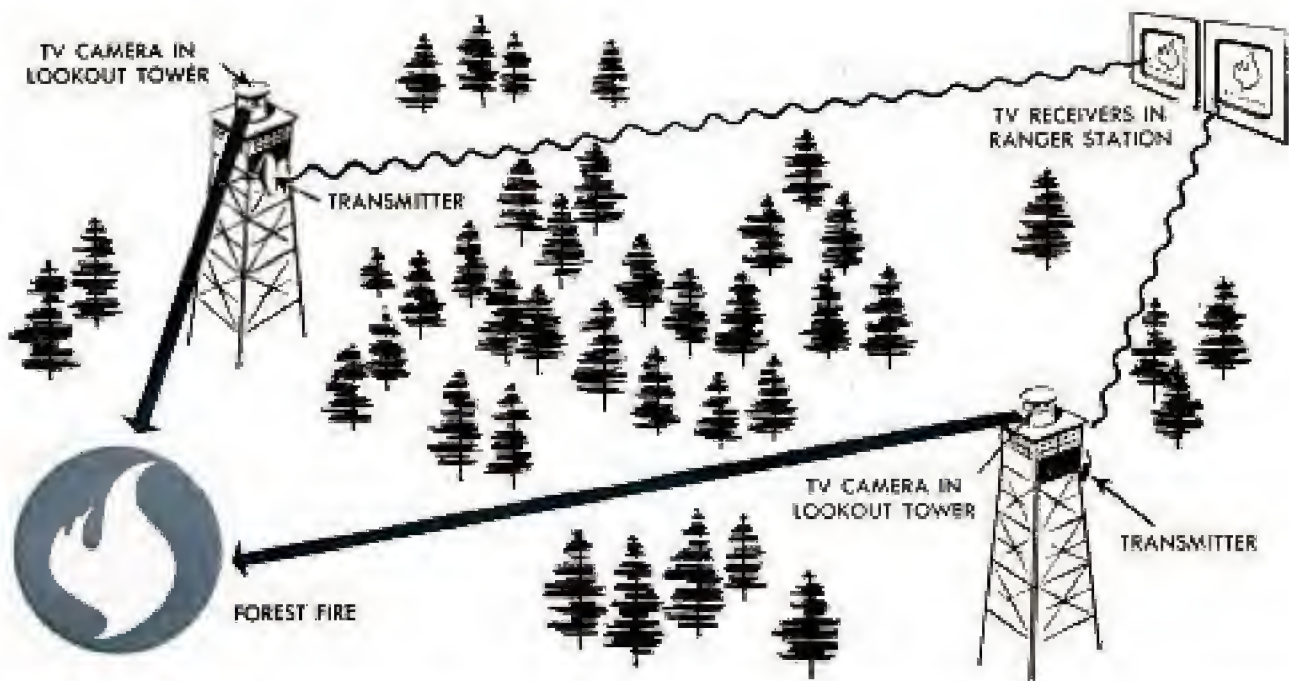
Microwave transmitter attached to lookout tower beams picture taken by TV camera in plastic dome to central control station

Closeup of plastic dome on lookout tower shows remotely controlled TV camera and the azimuth markings



with power saws or hand tools to make a trail several feet wide. Next, with shovels or bulldozer they cut a trench in the trail to expose raw soil. A backfire is then started to burn back slowly from the trench toward the real fire. When the flames meet, both fires die for lack of fuel. When possible, a road is used as the fire line; there pumper trucks can douse the timber alongside to stop the flames. Sometimes, when bone-dry timber and a strong wind combine, the fire becomes an explosive monster, a crown fire that roars violently through the treetops, actually leaping in one gulp across a canyon or ridge. A wide roadway or even a river may not stop it.

"Stop 'em when small," is the password among the civilian firefighters. A smouldering snag is a cinch to stop, but if a wind blossoms it into a 1000-acre fire, that's a different matter. A promising development for hitting fires quickly is the chain-saw pump, recently developed by a West Coast timber company. This is a standard 1½-inch fire pump mounted on a pack board. It has a special coupling that allows it to be attached to a power-saw gasoline motor. Practically all logging outfits use power saws today, and thus they can have a fire pump always on hand. Someone grabs the pack-board pump; another man some lengths of fire hose. The power-saw operator detaches the motor from his saw, brings it up to the fire to connect to the pump



Fire can be "spotted" in ranger station by studying the images with azimuth markings on two TV receivers

and the outfit is ready to use. An important point is that the power-saw operator knows every eccentricity of that motor and can get it going under the worst of conditions.

These civilian fire fighters have championed the use of vehicles in fire-protection work. Most lumber companies today have mobile fire patrols, men who do nothing in fire season but prevent and control forest fires in their timberlands. The state governments and forest protective associations (groups of neighboring tree farmers) have similar mobile patrols, as well as lookout towers on the mountaintops. The fact that untouched timberland is decreasing has greatly helped the use of vehicles for fire patrol—each new logging road makes it that much easier to spot and get to a fire. On the tree farms, thousands of miles of fire roads have been built so that fires can be reached quickly.

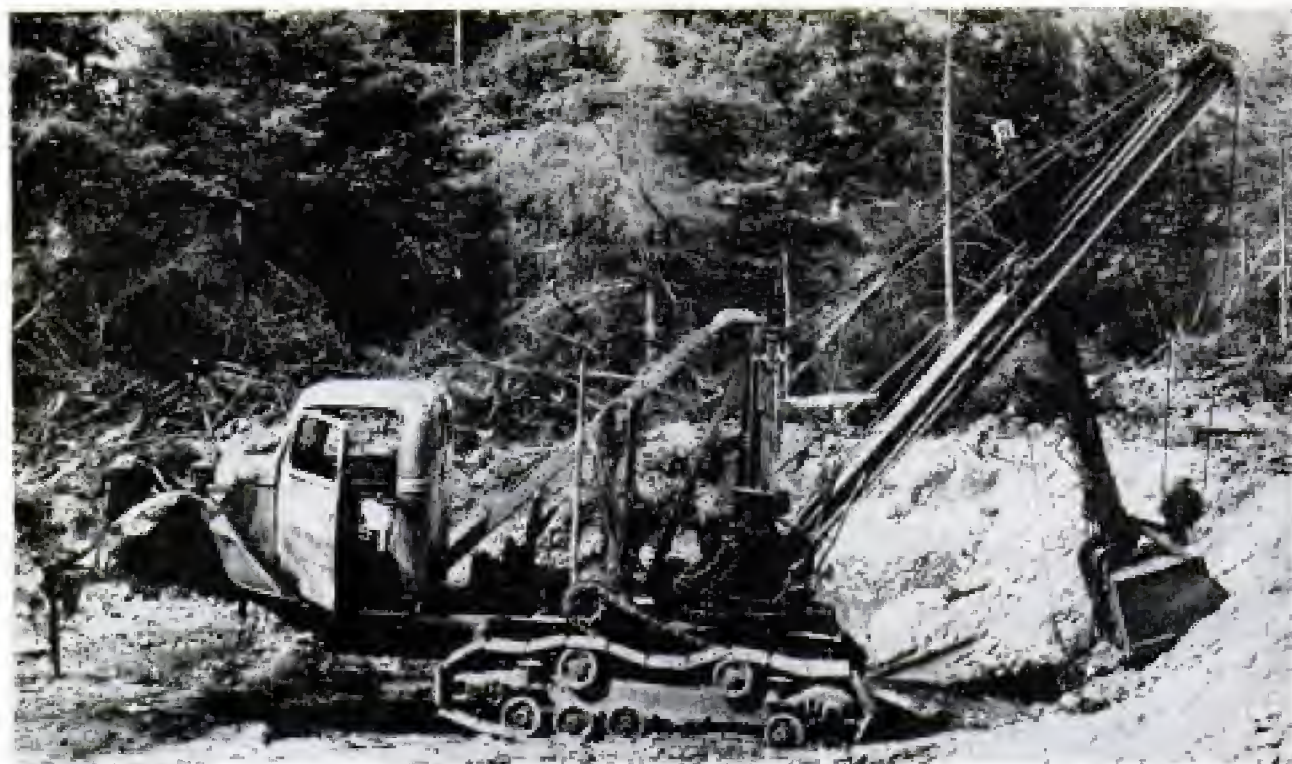
The roads strictly for fire protection are rough-torn tunnels through the timberland, accessible only in dry weather, the only time needed. Favorite vehicles of the mobile patrolmen are the Jeep and Dodge Power Wagon—four-wheel drives and pickup beds to carry men and equipment where needed. From the roads they travel, the patrolmen also favor oversize mud-and-ice tires. Many of the pickups have two-way radio; others rely on a network of telephones in the woods. Most of these patrol trucks carry water tanks and a small high-pressure pump

with hose. The pump works two ways—when near a water source it pumps directly into the fire by means of a suction line. In dry areas, the pump fills the tanks at a water hole and then empties the tanks at the fire. Fog nozzles are used to economize the water from the tanks. On railroad logging operations, the patrolmen use gas-powered speeders to patrol the tracks in a similar manner. You seldom see a steam locomotive on a logging railroad today—diesels are much less of a fire hazard.

(Continued to page 212)

Until television takes over the job, alert watchmen in lookout towers will continue the job of manning the fire finders





Is the Tractor on the Truck or the Truck on the Tractor?

Better look twice at this odd power shovel. Is the tractor on the truck, or the truck on the tractor? Actually the original motor of the power-shovel tractor was replaced with a Ford V-8 truck motor with the cab and part of the body frame still in-

fact. Despite its weird appearance the arrangement proved quite satisfactory, for the shovel now works faster and with more power than it did before. The shovel is used by a New York paper company to dig gravel for maintaining their logging roads.

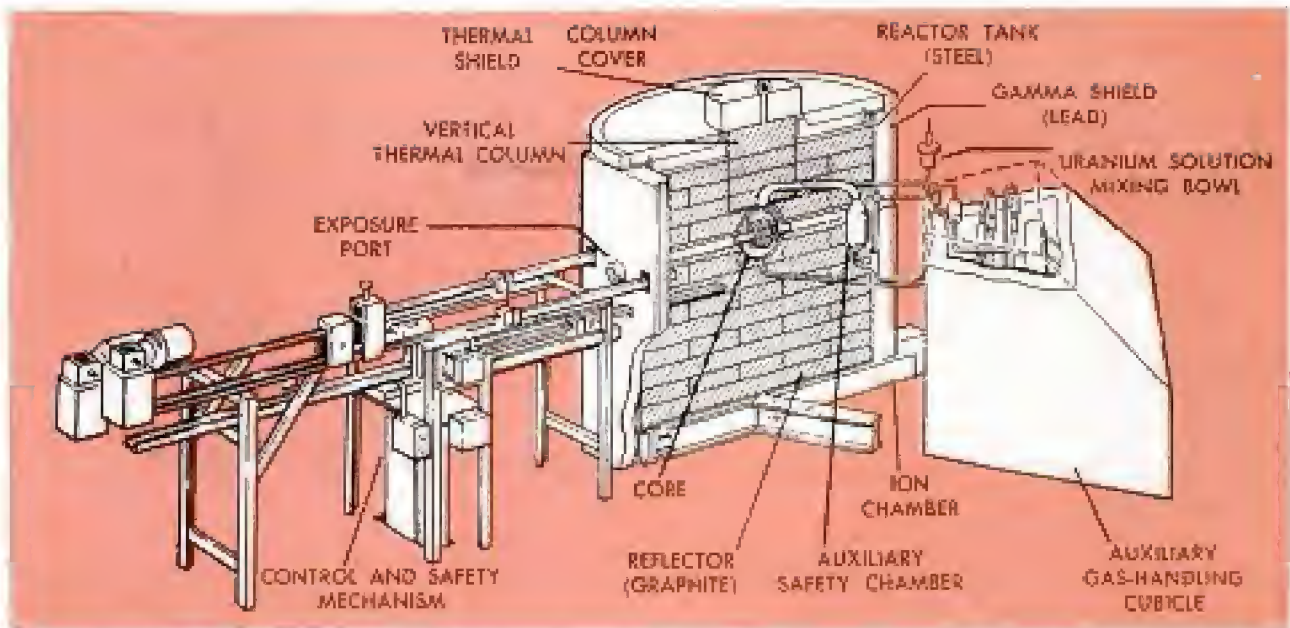
Portable German Television Tower Mounts on Transmitter Trailer



Televised German sports events are relayed to the main station by a mobile unit which swings into action in a few minutes. The transmitter is housed in a trailer which mounts an antenna mast that is quickly erected by cables and winch. A technician located in a cage at the top of the tower aims the antenna "mirror" to keep line-of-sight contact with the central station.

Electronic Guides for Blind Detect With Reflected Light

Electronic guides for the blind are being developed which warn the users of obstacles and potential hazards, such as curbs. A Signal Corps instrument which is carried like a lunch pail sends out a beam of light which is reflected by obstacles. The reflected light is picked up by a built-in receiving optical system and a vibrator in the handle translates the reflections into warnings and reassurances for the user. A similar device developed at M.I.T. warns by means of stimulator points on the handle. High-frequency vibrations in future electronic guides may warn of obstacles, and low-frequency vibrations of curb step-downs.

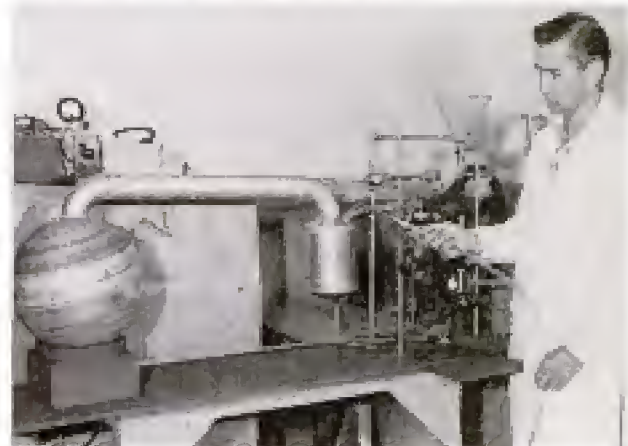


Core of the "tea kettle" is filled with uranium solution. Safety rods run through it to control the fission

"Tea Kettle" Atomic Reactor "Percolates" to Produce Power

Described as a "percolating tea kettle," a new atomic reactor built for the Atomic Energy Commission develops 100 watts of power. The reactor is the largest one ever built which operates on a closed-cycle system. A fissionable uranium compound is contained in a water solution which is sealed inside the reactor, retaining all the radioactive by-products instead of exhausting them into the open air. About four gallons of the solution are in a steel sphere. Safety rods run into the sphere to control the fission. A new development is an auxiliary safety chamber. If fission gets beyond a certain rate, gas "percolates" through the solution to carry the material into the safety chamber and away from the sphere.

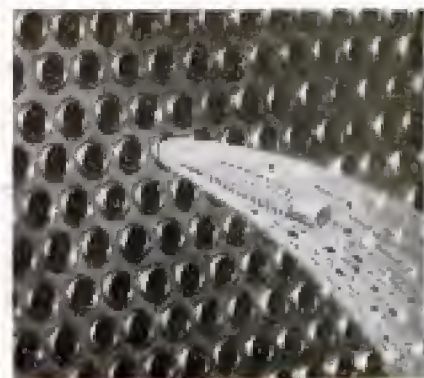
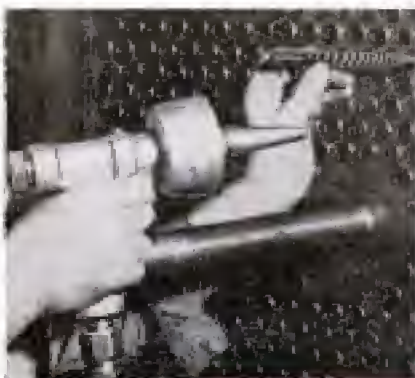
Scientist checks the core component before it is installed in its housing to complete the little reactor



Water Gun Forces Spinning Nylon Brush Through Cylinder

Tubes in condensers and heat exchangers are quickly cleaned by water pressure, using a gun which forces water and spinning nylon brushes through the openings. The operator inserts the brush in the tube and presses the tapered nozzle of his water gun into the tube end. The spiral design of the

brush gives it a spinning, scouring motion as the water rushes through. Sludge and other soft deposits, together with the spinning nylon brush, shoot out the other end of the tube, where the brushes are recovered for repeated use. Air pressure can also be used to drive the brushes.



The real test of a car starts when the owner takes the wheel. *Popular Mechanics* asked 1000 Ford owners from coast to coast about their cars. Here's what they say

The OWNERS REPORT: The OWNERS REPORT:



Best-Liked Features of 1954 Ford V8

41% ENGINE AND PERFORMANCE

30% HANDLING EASE

22% STYLING

Owners Report on New V8 Engine

64% HAS GIVEN NO TROUBLE

31% HAS GIVEN SOME TROUBLE

5% HAS GIVEN CONSIDERABLE TROUBLE

Owners Report on Acceleration

61% EXCELLENT

34% GOOD

5% POOR



The OWNERS REPORT

The OWNERS



FORD'S SWITCH TO OVERHEAD VALVES BOOSTS PERFORMANCE, SAY V8 OWNERS

Written by Ford Owners

FORD AND V8 go together—like bacon and eggs. This year for the first time in 22 years, Ford brought out an all-new V8, complete with overhead-valves, square design, deep block and many other improvements. What do Ford owners have to say about it?

The new engine is far and away the best-liked feature of the 1954 Ford, according to our survey of 1000 Ford owners. Forty-one percent said the engine and its performance were the things they liked most in their new Fords.

"Being a race fan and a fanatic for per-

FLOYD CLYMER'S ROAD TEST OF THE 1954 FORD V8

I DROVE THE TEST CAR, a Ford Victoria Crestline, from Los Angeles to Boise, Idaho, via San Francisco, Reno and Elko, Nev.—a distance of 1352 miles.

Under the hood was the new valve-in-head V8 with 130 horsepower. The "square" engine (3.62-inch bore and 3.60-inch stroke) gets the extra horsepower not by added displacement but by the use of overhead valves and high-turbulence combustion chambers. The block extends below the center of the crankshaft, offering more rigidity.

The new engine has more wallop at all speeds than the previous V8. It cruises nicely at 80 to 85 miles per hour with a top speedometer reading of 100. It is

(Continued to page 222)

formance, I probably demand more from my car than the average owner. The 1954 Ford is the best over-all car I have ever owned."—Centerburg, Ohio, plasterer.

"I like its ability to start quickly in all kinds of weather and its quick getaway."—Cheyenne, Wyo., railroad mail clerk.

"What I like best is the go-power in any gear. It is amazing how fast it will get up and go."—Fairmont, W. Va., miner.

"Have just returned from a 4800-mile trip into Mexico. Have nothing but praise for the new engine."—Eugene, Ore., owner.

However, there are some owners with reservations about the new engine.

"Valve-in-head engine too noisy. Tappets still loud after 1000-mile adjustment."—Glascow, Mont., physician.

"It doesn't seem to have the acceleration that my '51 had."—Sturgis, S. D., conservation worker.

"Like the getaway from a stop, but lost a lobe on camshaft at 3600 miles."—Reno, Nev., clerk.

"New engine is more powerful. It had a bad valve, but it was replaced at no cost

Floyd Clymer tested the Ford V8 for 1352 miles, many of them on winding mountain roads, and calls it "tops in the low-price field for handling"





Owners in almost every state (those shown in red on map) took part in the PM survey of the 1954 Ford

Percentages from PM Poll of 1954 Ford V8 Owners

OVER-ALL RATING OF THE FORD V8 BY THE OWNERS

Excellent	56%
Good	37%
Fair	7%
Poor	0%

Previous Ford owners.....	83%
Owners of 5 or more Fords previously.....	25%

Owners' rating of dealer service

Excellent	41%
Good	31%
Fair	16%
Poor	12%

Would buy another Ford?

Yes	77%
Might	20%
No	3%

Owners' opinion of ball-joint front suspension

Like	96%
Dislike.....	2%
No comment.....	2%

Owners' opinion of dash indicator lights

Like	66%
Dislike	31%
No comment.....	3%

Average miles per gallon

City driving.....	15.4
Country driving.....	18.5

Owners' comparisons of economy of new engine

Better than previous Ford V8.....	46%
Same as previous Ford V8.....	40%
Worse than previous Ford V8.....	14%

Oil consumption per 1000 miles

No quarts.....	86%
One quart.....	8%
More than one quart.....	6%

Experience with new V8 engine

Have had no trouble.....	64%
Have had some trouble.....	31%
Have had considerable trouble.....	5%

Most frequent engine trouble:

Valves	8%
Oil or water leaks.....	4%
Frequent stalling.....	5%

Handling characteristics

Excellent	74%
Good	24%
Poor	2%

Roadability

Excellent	63%
Good	36%
Poor	1%

Structural rigidity

Excellent	47%
Good	46%
Poor	7%

Acceleration from 0 m.p.h.

Excellent	61%
Good	34%
Poor	5%

Acceleration from 50 m.p.h.

Excellent	56%
Good	40%
Poor	4%

BEST-LIKED FEATURES

Engine and performance.....	41%
Handling ease.....	30%
Styling and appearance.....	22%
Comfort and riding quality.....	19%
Roadability and front suspension.....	19%

MOST FREQUENT COMPLAINTS

Rattles and shakes.....	13%
Poor body assembly.....	9%
Noisy engine.....	8%
Low gasoline mileage.....	7%
Oil-filter location.....	6%

Owners with no complaints at all.....30%

to me."—Huron, Ohio, production manager.

"Can't feel the difference in pickup with increased power of valve-in-head engine."

—Rahway, N. J., salesman.

Handling Praised by Owners

Second to performance in the list of best-liked features is handling ease.

"I am particularly pleased with the way my Ford handles on New Hampshire roads, considerably more curvy than in other sections of the country."—Concord, N. H., state employee.

"I like the way it holds the road and its ease of handling. Also the smooth-riding feature on rough country roads."—New Ulm, Minn., salesman.

"Excellent handling takes all the work out of driving."—Dallas, Tex., metalworker.

"We use our Ford hard both in fields and on roads, which are just dirt and gravel. There is no pavement less than 15 miles from us. Have no complaints as to handling."—Perth, N. Dak., farmer.

Next on the list of best-liked features is styling, with 22 percent mentioning it.

"It's a sporty looking car. Not too big and it fits in any garage."—Moonachie, N. J., refrigeration serviceman.

"Ford has gone completely above competition in attractiveness of body styles and colors. However, it has a long way to go in so far as rattles are concerned."—Chattanooga, Tenn., attorney.

"Distinctive styling. Upholstery gives it a tailored look."—New Market, Iowa, farmer.

Body Rattles Are Big Complaint

Most frequently mentioned complaint of the Ford owners is that the body rattles or that it makes too many noises.

"Body is shaky with too many rattles and squeaks. Very poor body rigidity. When you close the doors the posts are so weak they move."—Waterbury, Conn., master toolsetter.

"Some door play and body rattles in several places around dash and windows."—Sioux City, Iowa, meat processor.

Somewhat related to body rattles is the second most frequent complaint—poor assembly.

"It seems as though the car was just thrown together. I found places where bolts fell out altogether."—Larsen, Wash., sergeant.

"Doors and trim are not finished. Doors do not close right. Rain comes in over the top. Trim is loose."—Bronx, N. Y., lawyer.

"Had trouble with engine heating before I got it home the first time. Had bad thermostat. Engine leaked oil and water. One shock was out of its socket and bent over."—Lewiston, Idaho, power-shovel operator.

"Hood out of line, causing paint to chip."—Washington, D. C., airline superintendent.

"Dash had to be removed before door would shut properly."—Baring, Mo., farmer.

"Rear cross brace on frame was not riveted properly. Had been welded but not properly. I had to have it welded again."—Hampton, Va., office chief.

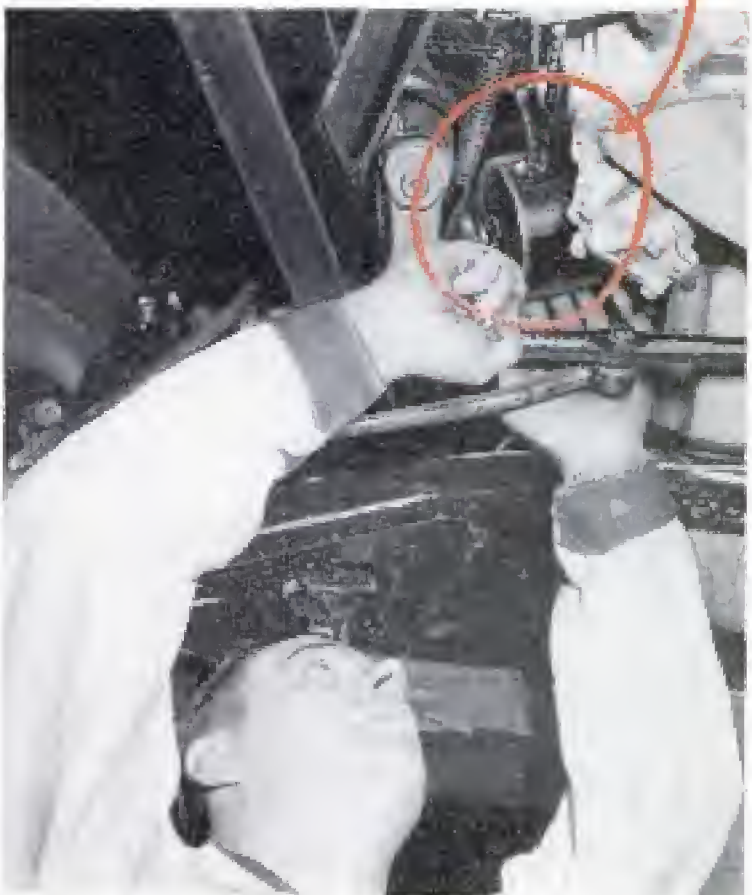
Owners Praise Riding Comfort

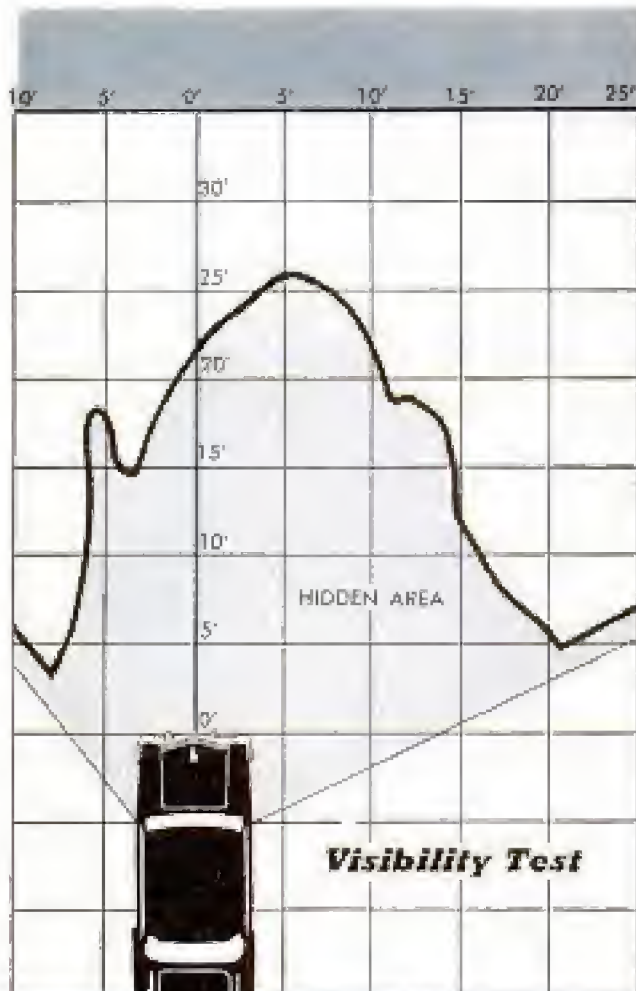
Nineteen percent of the owners listed riding comfort as a best-liked feature. Frequently the phrase "rides and feels like a big car" was written by the owner.



Owners praise the new Ford engine with its overhead valves and high-turbulence combustion chambers. But there were some complaints about the location of the oil filter (in the circle above) and the distributor

To service the oil filter, you have to put the car up on a lift. Even then it is not easy to get at. Owners say the new location makes it almost impossible for them to change filter cartridge themselves





Windshield reflections are a nuisance in this transparent-top model that has a light-colored dashboard

"Drives, rides and handles like one of the heavier and more expensive models." —Washington, D. C., bookbinder.

"Has the bigger-car feel."—Fargo, N. D., store manager.

There were some complaints, however, that the front seat was poorly shaped. Here is one of them:

"Front seat backrest is very fatiguing. Would like better design."—Hackensack, N. J., engineer.

Also high on the owners' list of desirable features was Ford's roadability and its ball-joint front suspension.

"About half of my driving is on country gravel roads and this car holds road best of any. Have kept track of all gas going

(Continued to page 214)

Acceleration Test

1954 FORD VICTORIA V8
with Fordomatic

1/4 mile from zero	Drive range only	21.9 sec.
	Low and Drive	21.3 sec.
1/2 mile from zero	Drive range only	33.1 sec.
	Low only	5.2 sec.
0 to 30 m.p.h.	Drive range only	17.4 sec.
	Low and Drive	16.9 sec.

Top speed by speedometer 99 m.p.h.
Actual top speed about 6% less

Economy Test

MILES PER GALLON
Constant-Speed Mileage

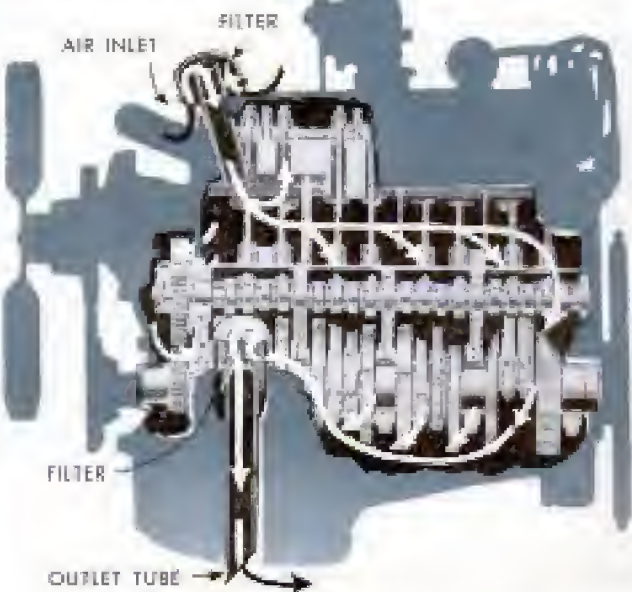
Constant 30 m.p.h.	25.4
Constant 50 m.p.h.	21.5
Constant 60 m.p.h.	20.2
Constant 75 m.p.h.	15.3

Cross-Country Mileage

* Los Angeles to San Francisco, Calif.	19.4
** San Francisco to Reno, Nev.	18.3
** Reno to Boise, Idaho	20.8

*Used premium gasoline **Used regular gasoline

Arrows show flow of air inside engine. Clean air carries corrosive fumes out to the atmosphere





United Air Lines photos

Sighter (left) is used by color-camera operator inside the aircraft. Right, inserting camera in box in tail

Electronically Controlled Cameras on Plane Shoot Travel Film

Encased in aluminum boxes attached above and below an airliner, electronically operated 16-mm. color cameras shot the aerial footage for a California travel film. One box was mounted on the leading edge of the vertical stabilizer and the other was

suspended at the rear of the fuselage of a United Airlines transport plane. Inside the aircraft, both cameras were controlled by an operator using a sighter that duplicated the area they could photograph. Touching a button activated the shutters.

Portable Compressor For Skin Divers

Tanks of compressed breathable air, such as used by underwater swimmers and fishermen, are recharged quickly by a portable compressor that weighs only 50 pounds. It is powered by a $\frac{1}{2}$ -horsepower electric motor and compresses 70 cubic feet of air in 100 minutes. A separator prevents the entrance of oil or moisture into stored air.



Endless Belt Takes Dictation In Magnetic Recorder

Dictation is recorded on an endless magnetic belt in a new office machine. Although magnetic recording is not new, this is said to be the first office machine using a magnetic belt instead of reels of wire or tape. The belt can be used thousands of times, folded flat for mailing, or filed for future reference. Up to 15 minutes of dictation can be recorded on each belt. To correct an error, the dictator simply backs up the belt and redictates over his mistake.



Stroller Is Light Enough to be Carried on Arm Like Umbrella



Compact enough to be carried over the arm like a folded umbrella, a lightweight stroller is proving to be a big hit with British mothers. Called the "Slickster," the stroller was developed by an English schoolteacher after his wife complained about the awkward bulk of most models. Now she can carry it with her on the bus. The stroller weighs only four pounds yet it is strong enough to support an adult. It can be used as a high chair simply by locking it with a snap-on brake.

Bathtub Door Prevents Slipping

Slipping while climbing in or out of the bathtub will be a thing of the past if Swedish inventor Per Bergman has his way. Bergman has come up with a tub with a door. Turn two handles, pull toward you and a section of the tub swings out. The door is compressed against a gasket around the frame to provide a watertight seal. The tub with a door is designed primarily for old or disabled persons.



Reversible Plow Alters Automatically

Contour plowing is speeded with a two-way plow that automatically reverses itself when it is raised at the end of each furrow. Engineered to fit all three-point hitches, the plow mounts two 26-inch disks scoured by one-piece, full-width scrapers. All the operator has to do is to pull the quadrant lever to lift the plow; the rest is automatic. Clean plowing and ruggedness are some other features of the unit.

Highway "Pullman" Sleeps Eight



Schriener prepares breakfast in the land yacht's compact kitchen. Beside him are combination sink, electric range and refrigerator. Electric roaster is separate unit

YOU CAN cook a meal or take a shower in a Greyhound bus that's been remodeled by a San Antonio, Tex., lumberman. Ernest Schriener, who likes to take his friends along on trips, converted the bus into a rolling abode that sleeps eight and includes a living room and complete kitchen. Guests can telephone, lounge on comfortable couches, or bathe in a sit-down shower while they're moving through the countryside. The bulky vehicle gets only five miles to the gallon of gasoline, but this includes the fuel needed to supply the electric-power unit. Fresh water is stored in a 200-gallon tank and waste water empties into a large container beneath the bus. Hot and cold running water for the kitchen and bathroom is supplied under high pressure. Besides plenty of hot water heated by an electric unit, the bus has summer air conditioning and heat in the winter.

Pullman-type bunks include reading lamps and shelves for personal articles. Luggage is stored beneath bus



Mobile telephone keeps guests in touch with home or office, can be operated while the bus is in transit

Schriener takes the wheel. Bus gets five miles to the gallon, including fuel for electric-power unit



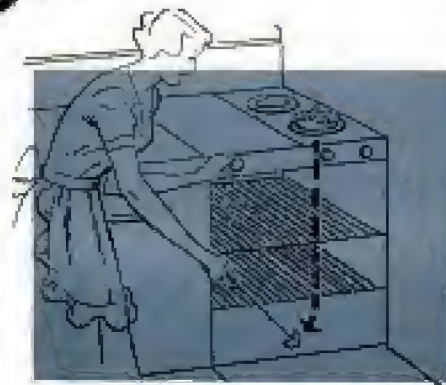
WHAT'S NEW FOR Your Home



LOCK CATCH for hooks, above, prevents small children from unlatching screen doors and windows. It can be snapped quickly into position with one hand



DUST CATCHER, operating as attachment to a vacuum cleaner, pulls in dust when mop is shaken over conical-shaped receptacle. This makes it possible to shake the mop without scattering dust



GARBAGE ELIMINATOR disposes of refuse by chemical action, which liquefies deposits. After the chemical is applied to the first deposit, the action continues automatically

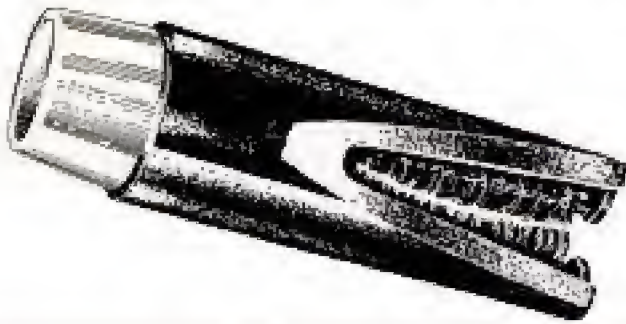


MOTIF DESIGN ROLLER for painting walls applies any one of a choice of 32 patterns or a combination of both patterns and colors can be used. Any type of paint can be used in rollers





BRUSH-ON LIQUID MASKING TAPE dries to consistency of plastic film and can be peeled off after paint is applied. Any of the liquid that spreads over onto wood areas actually bonds to it and becomes a base for paint



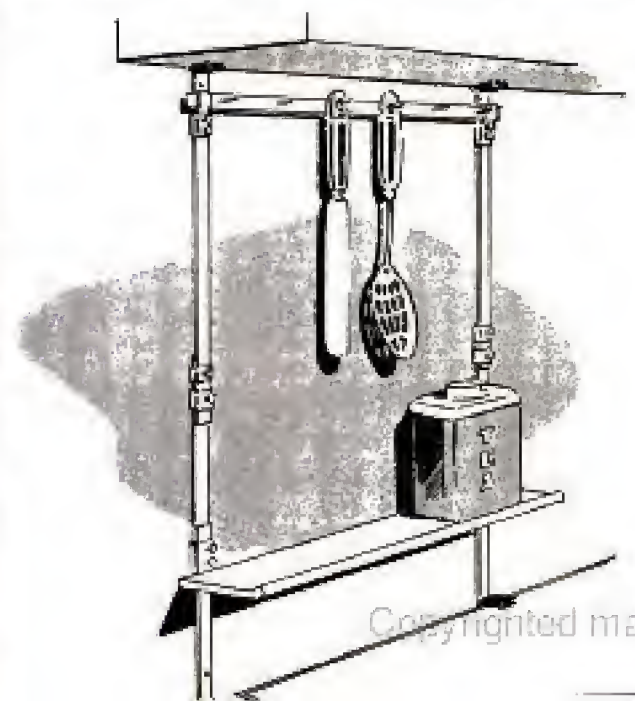
VENETIAN-BLIND CLEANER has a pair of revolving brushes that whisk the dust into an attached vacuum cleaner. Driven by air, the self-cleaning brushes are shaped to fit the contours of the curved slats



GAS-OVEN LIGHTER that is ignited by flame from a top burner has a long-lasting element that is extinguished by retraction

RUBBER-COVERED BRACKETS that hold bed sheets and blankets several inches above the sleeper's feet can be folded down onto the mattress when not being used

UTENSIL RACK and shelf is held firmly in place by a clip arrangement that slips between a kitchen cabinet or counter and the wall. It is adjustable



Our HOTTEST Ship's on Shore



Decontamination team in protective garb goes through drill. Man at left checks companion for radioactivity

PREPARE for atomic attack!" The startling order echoes through the ship. Suddenly, the air is alive with noise. Then, through the racket comes the penetrating sound of general-quarters alarm as men race for battle stations.

String of "hot" luminous buttons is hidden in pipe just before mock attack. Monitors must locate it

It's all over in a moment, except for one thing. From decks, bulkheads and crannies of the ship's superstructure, atomic radiation is pouring. Monitoring teams dressed in goggle-eyed masks, coveralls, and carrying nuclear counters prowl through the

Trainee with radiation counter spots location of buttons. Via intercom he will notify damage control



affected areas. They take readings and report dangerous radioactive spots to a damage-control center below, where decontamination squads are dispatched to remove the source of the dangerous rays.

Week after week, this same action-filled scene is re-enacted at the Fleet Training Center in Norfolk, Va. Here, within the walls of the Center's Atomic Defense School, sits the victim of hundreds of "atom bomb" attacks—a full-scale mock ship simulating the superstructure of a destroyer escort. Built of plywood, the structure towers three stories to a vaulted ceiling with built-in horizons. The make-believe training ship is complete with hatches, ladders, intercom system, portholes, bridge, decks and other standard features, adding realism to the mock attacks.

Under the command of Lt. E. J. Leahy, director of the school, the much-bombed "ship" is made to come alive with real radioactivity in order to train special crews in the atomic-defense school's specialty—shipboard monitoring and decontamination.

It all began soon after a towering mass of radioactive water erupted from Bikini Lagoon following the explosion of an underwater atom bomb. Of the unmanned naval ships stationed around the rim of

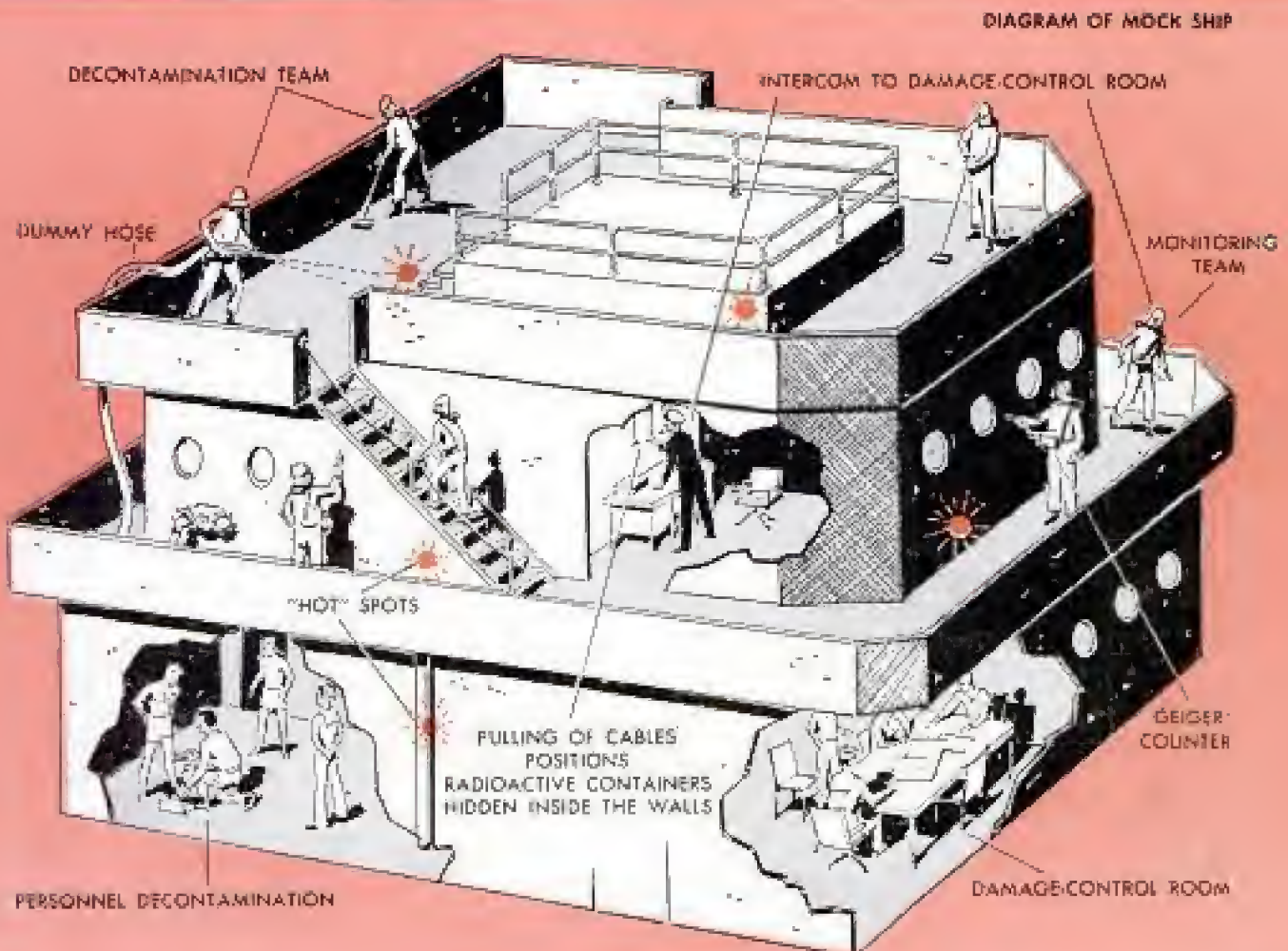
the blast, some collapsed and others sank. The battered wrecks still afloat were "sizzling hot with radioactivity," newspapers said.

But the Navy wasn't sinking anything salvable. Decontamination crews, clad in protective clothing, removed most radioactive particles by physical methods—by scrubbing, washing down and wet sand-blasting. Chemical solvents ate away stubborn radioactive surfaces so they could be washed overboard. Even left alone, dangerous rays slowly died away. The aircraft carrier *Independence*, close to "ground zero" at Bikini, lost its dangerous radioactivity in a year and now serves as a floating experimental laboratory.

Today, the navy is preparing its crews to cope with atomic attacks by a standard procedure. The intensive five-day course at Norfolk includes a series of lectures in general-quarters assignments, damage control, monitoring and decontamination of the men. Then comes the "battle problem."

On the day Lieutenant Leahy sounds general quarters, every man knows where he's supposed to go. Some men scurry to the bridge, others to various compartments. The personnel decontamination station is manned and ready to cleanse anyone

Trial run starts after officer raises radioactive materials from lead shields. Decontamination teams go to work





Radioactive sample encased in lead shield fastens at top to cable. Radioactivity is released when . . .



Instructor pulls cable, exposing sample any amount. As the decontamination proceeds, he lowers samples

who gets a simulated overdose of rays. Men are posted at telephones and speaking tubes. Details are dispatched to close hatches and to man the dummy fire hoses, which they use to "spray down" all weather surfaces on the ship. "It's easier to wash radiation from a wet surface than a dry one," Lieutenant Leahy explains.

All hands duck inside the ship as the "atomic explosion" thunders down on them in a shattering tape-recorded maelstrom of sound. Within minutes, the trainee monitoring teams in their strange costumes are out on deck with radiation detectors, "sniffing" around for "hot" areas. Needles waver and instruments crackle here and there around the ship, excited by genuine rays.

Before the problem starts, the instructors conceal heavy lead containers of radium and cobalt 60 in special hiding places. Cables, hooked to the radioactive specimens, lead up to the bridge where a Navy chief petty officer can lift them free of the containers, permitting their radiations to be picked up.

Radium-coated buttons may be dropped in a hole in a pipe. Even a small bit of radium can make a pretty hot area around itself.

When crew finds a hot spot, its location is instantly reported to Damage Control Central over the intercom system. Down below, officers grouped around a table in the damage-control room map the hot spots as they are reported. Decontamination squads in protective clothing are dispatched

immediately to these areas with proper scrubbing equipment. Sawdust, simulating radioactive material is swept up and the radiation source is lowered back into its container so that when the monitors recheck the spot they can legitimately report no radiation.

When all the teams have completed their rounds and the last "hot spot" is cleaned up, all hands report to personnel decontamination, where Geiger counters explore them personally for any radioactive material they may have picked up. To add realism, some of the school's garments are equipped with hidden luminous buttons. Hence, the monitors find that a few men are "hot" and have to be decontaminated. Corpsmen check them for "open wounds," and hurry them off to a soapy shower and rubdown. Then they're monitored again. If they still tweak the needle, back they go for another shower until they are completely decontaminated.

When the last man clears the monitors, the plywood ship can chalk up another atomic attack survived in its program of training our fleet in the business of preserving men and ships in case of atomic war. ★ ★ ★

If you do not find the information you need in the WHERE-TO-BUY-IT INDEX, starting on page 12, sources of further information are available without charge from Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11



Winder Loads Spinning Reels

Fishing lines can be transferred to spools used on spinning reels without a twist with a hand winder. It accommodates several sizes of spools. The line is cross-wound by moving the factory spool back and forth. The winding device also can be employed to put backing under a spinning line and to reverse a line onto a standard spinning-reel spool.



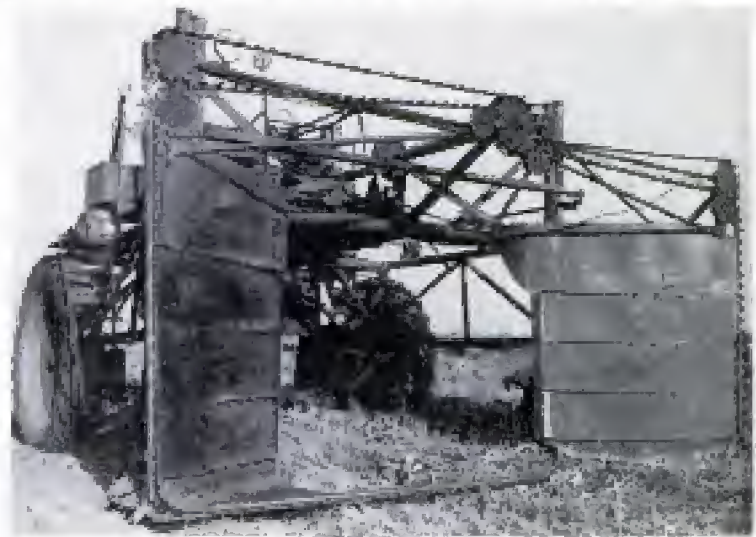
Consolidated Vultee Aircraft Corp. photo

Test Pads Glued to Aircraft Easily Removed With Dry Ice

Using Dry Ice saves tension pads worth \$60,000 yearly at an aircraft plant. Glued to aircraft surfaces for test purposes, the four-inch-square rubber pads were formerly removed by using a hack saw or an electric iron. Both methods destroyed the pads, which cost \$12 each. Applying Dry Ice makes it possible to pry the pads off easily and preserves them for future use.

Seed Harvester Slashes, "Swallows" and Windrows Sugar-Beet Crop

Eight rows of sugar beets are slashed and windrowed at one time by a big harvesting machine that appears to swallow the crop. The machine, designed and built by Lemuel E. Shaw of Hemet, Calif., harvests sugar beets planted for seed only. The stalks form a matted growth up to six feet high, and



the cutter slashes through them at speeds up to 15 miles per hour. On the front of the machine are two contrarotating chains with steel cutting blades welded to the links. Deflectors behind the chains guide the cut stalks through the open throat of the machine and place the seed-bearing tassels in the center of the windrow in preparation for harvesting the seed.



A moment after the drop the water turns to mist and thousands of fingerling trout plunge toward the lake

It's Raining BABY TROUT

By Claude M. Kreider

LAST SUMMER almost 3,000,000 baby trout "rained down" over 662 blue lakes in California's lofty Sierras.

This was not a miracle of nature brought about by the storm clouds hovering over the high peaks. It was a manmade phenomenon, the result of a long experiment in modern trout culture and the planting of fish by airplane.

For many years Sierra lakes, barren of fish life, and other lakes heavily fished, were stocked with trout by the use of pack mules, each carrying two 10-gallon cans of baby fish. Many were lost in transport, others injured. The packers had to stop often along the rough trails to replenish the water in the cans and thus provide the necessary oxygen to keep the fish alive.

Often there was no trail, even for the sure-footed mules, and the men had to complete the journey carrying the cans upon their backs. Several days were often required for one journey. And the cost was prohibitive, averaging almost \$20 per thousand trout.

Aerial planting today does the job for \$1.25 per thousand fish, and far more can be stocked during the short Sierra summer than could be planted with pack trains.

Experimental airplane stocking was first undertaken by the California Department of Fish and Game in 1946, using a small, 165-horsepower monoplane. This was not quite suitable for the job of flying over 14,000-foot peaks, where strong down drafts and sudden air currents whipped through the granite canyons and basins.

Would trout live when dropped at the high speed necessary for safe flight? Fish were dropped in five-gallon ice-cream containers, the bottoms sealed with wax, and in tin cans with no lids. Fish were dumped directly from the plane.

The "free falling" method was found best, in which the fish were "rained down" with the water which carried them. Today trout up to four inches in length can be dropped with 100 percent survival. Those weighing six to eight to the pound show a survival of 85 percent. But larger fish up

to 15 inches in length are killed by the impact.

The plane in use today is a Beechcraft, powered with two 450-horsepower engines. And chief pilot of the department, Al Reese, whose job is probably one of the most ticklish in peacetime aviation, can whip it down with rare precision over a remote lake for a fish drop.

Always a problem in fish transportation is sufficient aeration of the water in the fish cans. In land travel by truck, a small compressor furnishes air, and the same method has been adapted to use in the plane.

The fingerling trout are carried in 10-gallon aluminum cans with wide mouths. From eight to fifteen are carried for a fish drop, although more are possible, and 10,000 fingerlings have been dropped at one time.

A compressor driven by a 24-volt electric motor supplies air to the cans through a battery of rubber hoses. Another hose aerates the water in the planting hopper.

The 50-gallon hopper is made of aluminum and has crimped and welded seams. A rectangular opening cut in the floor of the

Copilot of the plane pours water and baby trout into the planting hopper just before arrival at the lake



At the hatchery a fish culturist removes infertile eggs. Those that remain may inspire some "big fish" stories in the future

fuselage, accommodates its bottom flap. This is hinged on the forward side, and is quickly opened by a hand lever operated by the copilot or fish culturist when a drop is to be made.

A smaller opening through the floor just back of the hopper provides space for a range finder, which is used by the operator to gain an accurate "sight" on the lake to be planted.

On target! He sights down through an aiming hole, pulls lever at right instant to "bomb" lake with fish





Formerly the mountain lakes could only be stocked with fish brought in by pack train over remote trails

A preliminary flight is usually made at high altitude, the plane often rising to 20,000 feet while the problem is studied. Area maps are of little use in this work, but aerial photographs are useful in pin-pointing many small unnamed lakes not shown on any map.

Most of the trout to be planted are pro-

Baby trout are extremely sensitive. Ice is added to cans to keep temperature just right and air hoses aerate the water



duced at the Mt. Whitney State Hatchery at the base of the Sierras. These are trucked to the airstrip in ordinary 10-gallon fish cans and there transferred to the aluminum cans aboard the plane.

The cans must be strategically placed in the fuselage for balance and best handling of the plane. So closely does the mighty Sierra wall arise to the west that the pilot must fly back and forth to gain sufficient elevation to clear the peaks, many of them 14,000 feet high.

Small lakes are passed over in a few seconds. The correct descent for safety and accurate fish dropping must be gauged as the plane clears jagged peaks and basin walls and slants steeply down to that tiny, blue "dot" below.

The operator at the hopper has already poured fish and water from one or more cans into the hopper. As the plane slants down he takes a last, quick sight through the small opening and pulls the release lever. Fish and water are actually sucked from the hopper. The water is at once converted to mist by the propeller wash and resembles a puff of white smoke. But the little trout drop unharmed into their new environment. Only a few fish hit the water head first.

The accuracy of this target work is astounding. Al Reese and his assistant can score a bull's-eye on a tiny lake with a surface area of only two or three acres. Many of

(Continued to page 226)



Matching Storm Window Contains Swing-Out Center Section

You're hardly aware of the presence of a new storm window that matches the inner sash and contains a center section that swings out when the inner window is opened. A coupler joins the inner and outer casement-type sections. The storm sash

comes complete with glass, weather stripping and necessary hardware. It is part of a prefabricated window installation or can be added to existing windows of the same type. Installation is simple, needing only five storm-sash fasteners.

Plastic Liner for Leaky Gas Pipes Ends Need for Replacement

Leaky gas lines in Denver are repaired with a plastic "inner tube" that makes them good as new. A pneumatic reamer powered by a portable air compressor works its way through the pipe, producing a smooth, even bore. Lengths up to 80 feet are cleaned with

the tool. Then the plastic pipe is pushed through and the new connection made. The old pipe does not have to be dug up, and the new lining is said to be more permanent than metal—it cannot corrode, and is not damaged by soil chemicals.





Telescoping Awning Opens Electrically

With the push of a button you can open or close a new telescoping awning made of aluminum. A $\frac{1}{20}$ -horsepower electric motor mounted below the awning does the work. It is designed for stores and residences, and can also be operated manually.

Treated Paper Needs No Carbons

You don't need carbons to make copies of a letter you write on a chemically treated paper. The pressure of a pencil or typewriter character causes a chemical on the back of one sheet to unite with a chemical on the top of the next sheet. The result is a blue copy of the original impression. Four handwritten copies and up to seven typewritten copies can be produced with the method.

Chemical Found in Human Hand Chases Fish From Danger Areas

Small doses of a mysterious substance found in the human hand, deer's foot and seal skin may prevent salmon from straying on their way to and from inland spawning areas. Introduced into the water around

high dams, polluted waters and diversion channels, the chemical repels the fish. The substance is being analyzed by Canadian scientists in an attempt to discover its physical and chemical properties.

"Automat" Sells Toys To Youngsters

When youngsters in Stockholm go shopping they can buy their toys in a new "automat for playthings." The display machine is divided into bins with a window in each bin. The child inspects the toys through the windows and deposits his money to receive the toy he selects.

Dye Traces Eddies Formed by Boat

How eddies are formed when a boat or submarine moves through the water is revealed by a method developed in Yugoslavia. An object coated with silica gel is placed in a water stream containing a tiny amount of dye that coats on different parts of the object shows how the water passed over it and where eddies were formed. The method is also helpful in the study of rivers and fluid flow in water pipes.





Clamp acts as the "hand" holding a potato peeler

Gadgets Ease Chores Of Physically Handicapped

Most of the back-bending, lifting and pulling is eliminated from housework in a kitchen designed especially for physically handicapped housewives. It is being used in the occupational therapy department of a London hospital. The kitchen is U-shaped and has a sink in the middle. An "overhead railway" with a sling to support weak arms and shoulders runs across the room. There is a safety belt attached to the sink for women who cannot stand without help. A universal clamp, attached to the work bench, solves the problem of peeling potatoes or grating cheese with the use of only one arm. Many ideas used in the model kitchen can be easily adapted for home use.

Suction pad holds saucepan steady while one-handed person stirs. A small, hand-turned tap releases pot



Using a pedal-driven drill operated through a flexible shaft, a patient gets work done and exercises weakened leg muscles. Below, slings brace weak arms and a press clamp grips bread while it is being cut





But you should have seen the one that got away!



"God, Orville, it flies!"

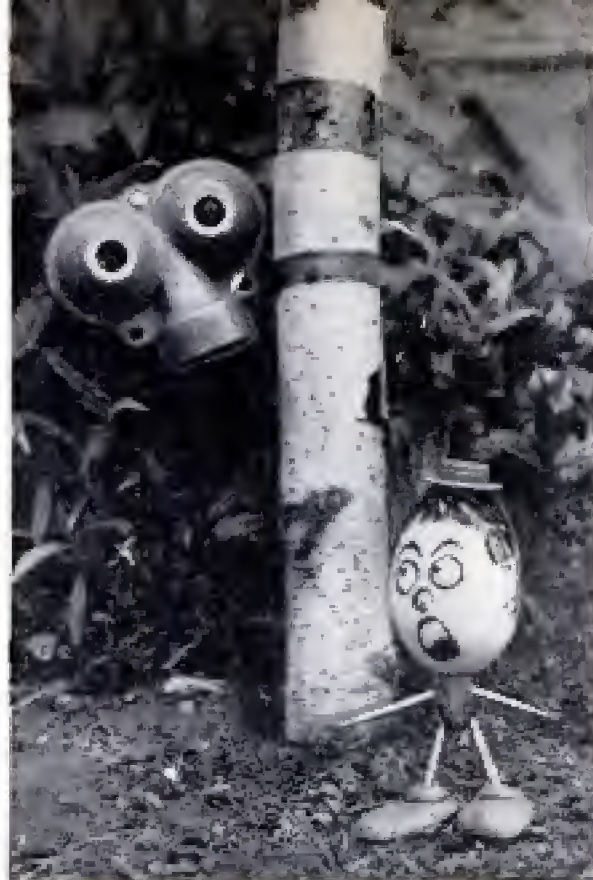
MONSTERS

"You know how I love olives!"



Moose heading east? Dragon heading west?





"Now do as you're told! Climb back in that saucer and take off again!"



You never know what you'll find when you lift up a rock and look underneath

IN YOUR TOOL CHEST

By Barnett Fowler

DON'T ASK ME WHY, but I took these pictures. And now, to cap it all, I'm submitting them, in case your readers might be interested. Tools can't talk back, and maybe it's just as well. However, mute as they are, tools make fine animal crackers if they're touched up with a spot of paint and posed just right. Pliers and clothesline tighteners, hinges and lawn sprinklers can become pleasant little "monsters" that will pose willingly for your camera. We even converted an old furnace damper control into a moose or a strange little creature with an up-turned nose, depending upon how you look at him. Almost any tool or piece of junk can be made into an odd being of one kind or another. Best of all, it's fun for kids as well as adults. Why not open your tool chest and try it yourself? ★ ★ ★

Son of the author tries making a creature of his own. All that's required is imagination plus a spot or two of paint





Glistening bars of zirconium, 99.9 percent pure, are raised from tank which has been flooded with water as a precaution against fire. Metal is deposited on wires by electrochemical action. Below, ingots of zirconium being tested for hardness before production use at Westinghouse Atomic Power Division



Tricky Zirconium Hailed Vital Metal of Atom Age

INDUSTRY'S NEWEST discovery is a curious, silvery metal known to man for over 150 years. In powdered form it can easily explode. It burns fiercely. Water thrown on it merely spreads the blaze. If handled properly, it is strong, stable and corrosion-resistant. Otherwise, it's unworkable and corrodible.

But because it doesn't absorb neutrons (the atomic bullets that split uranium bombs and keep the atomic engine "running") atomic scientists place zirconium second only in importance to uranium.

Discovered in 1789, zirconium didn't come into its own until 1948. Then it was selected for use in the first atomic submarine after tests with iron, steel and other metals failed.

Zirconium's nonmilitary uses are as varied and paradoxical as the metal itself. Compounds of the metal are used in making poison-ivy ointments, water-repellents, and for improving the quality of furs. Zircon gems, a diamond-like crystal form, are sold widely in jewelry stores.

Extensive ore deposits have been found in Australia, Brazil, and on Florida and Oregon beaches. But extraction is a costly process.

Production begins with zirconium sponge—porous chunks resembling coke. The ore is dumped into a tank with a compound of zirconium and iodine. Hairpin-shaped wires of zirconium are suspended from the top of the tank. When electricity is passed through the wires a chemical reaction occurs. Pure zirconium is separated from the compound and deposited on the wires. The iodine freed attracts more zirconium from the sponge ore and the cycle continues. Eventually, the laden wires are removed and melted into ingots which are then forged and rolled into shapes usable by the atomic-power plant.

The metal's noncorrosion properties promise it a bright future in the chemical and petroleum industry. Surgeons may use it to make repairs in the human skeleton. After a long adolescence, the strange metal has come of age.



Log is branded with a blow from heavy hammer that is faced with company symbol

LOG BRANDS FOIL RUSTLERS

COWBOYS DON'T HAVE a monopoly on branding. For over a hundred years timbermen have branded logs with such symbols as pigs, cows, birds, keys, barrels, pistols, arrows and even animal tracks.

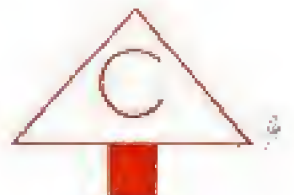
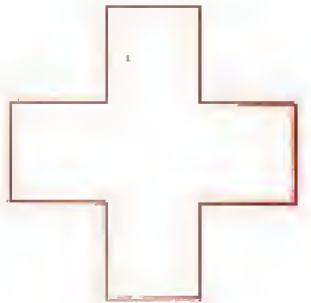
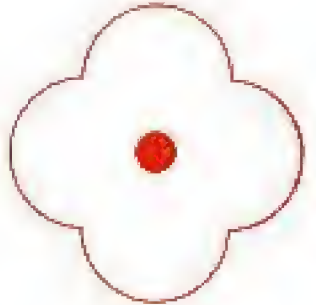
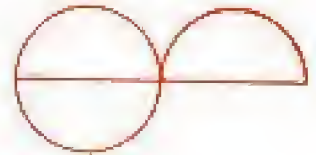
Loggers apply their marks with a heavy branding hammer which drives an impression deep into the end of a log. Even if the branded portion of the log is sawed off, chemical treatment will reproduce a legible impression of the mark to thwart timber rustlers.

An owner's brand is usually applied several times around the perimeter of the log so that scalers can read the brand no matter in what position the log is floating. "Bark hacks" cut into a log with an ax were once used for identification purposes. They were replaced by branding, however, because sorters and tallymen wasted too much time turning logs to locate the marks.

Weyerhaeuser Timber brand contains company initials. Other brands are at right



JULY 1954





Built by Jay Everett of Los Angeles, a trim sports coupe features an aluminum body and a Cadillac engine

California Customs

MANY A MAN has built his own house. Why, asks the custom-car fraternity, shouldn't he build his own car? And many of them do build their own with an imagination and vigor that, sometimes at least, puts Detroit's "dream cars" to shame.

Not all custom cars look good to everyone—they are not intended to. They are a revolt against mass-produced conformity. Sometimes the desire to be different runs away with the design, sometimes not.

The usual procedure is to start with a conventional frame (although a sports-car frame such as a Kurtis may be used), then combine custom-made parts with elements

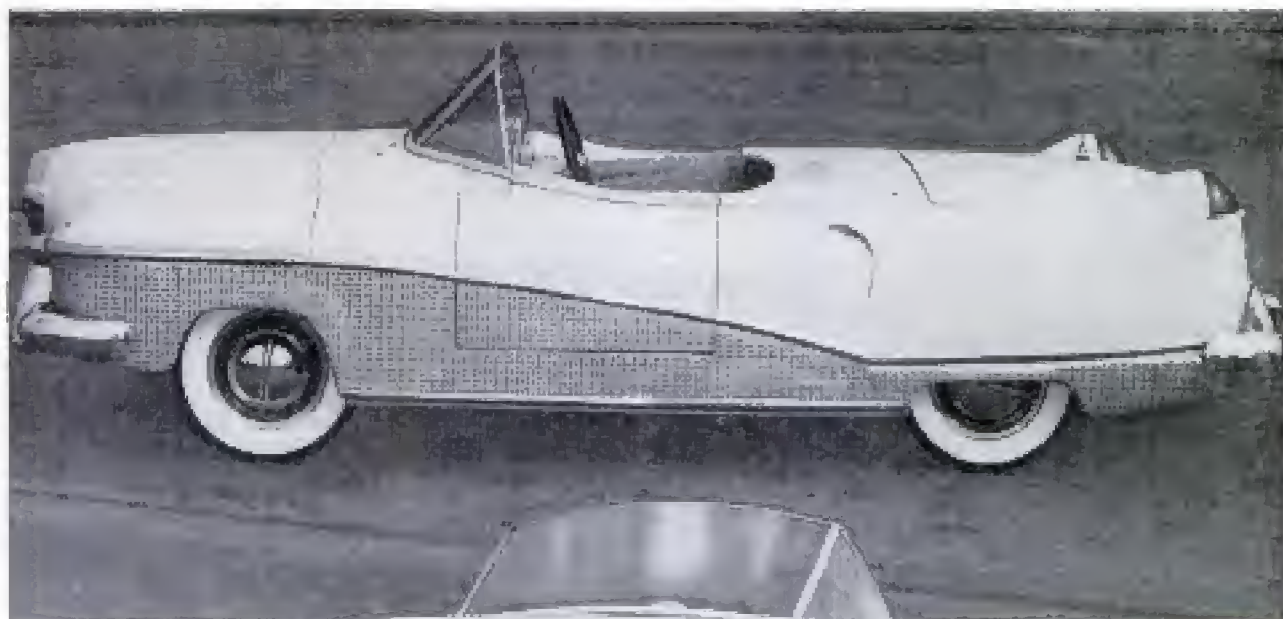
of production cars to get a desired design.

For example, the "Baby LeSabre" shown on the opposite page was originally a Crosley station wagon. Its nose and hood are cut down from a 1948 Ford; part of the front fenders are 1941 Oldsmobile; the windshield is a portion of a 1952 Buick's; the front bumper combines parts of a 1948 Kaiser and a Mercury; tail-fin lights are 1948 Cadillac; instrument panel is from a 1951 Pontiac and the rest of the body is hand molded of 20-gauge metal.

California has many talented custom-car builders. Shown here are three examples of their craftsmanship. ★ ★ ★

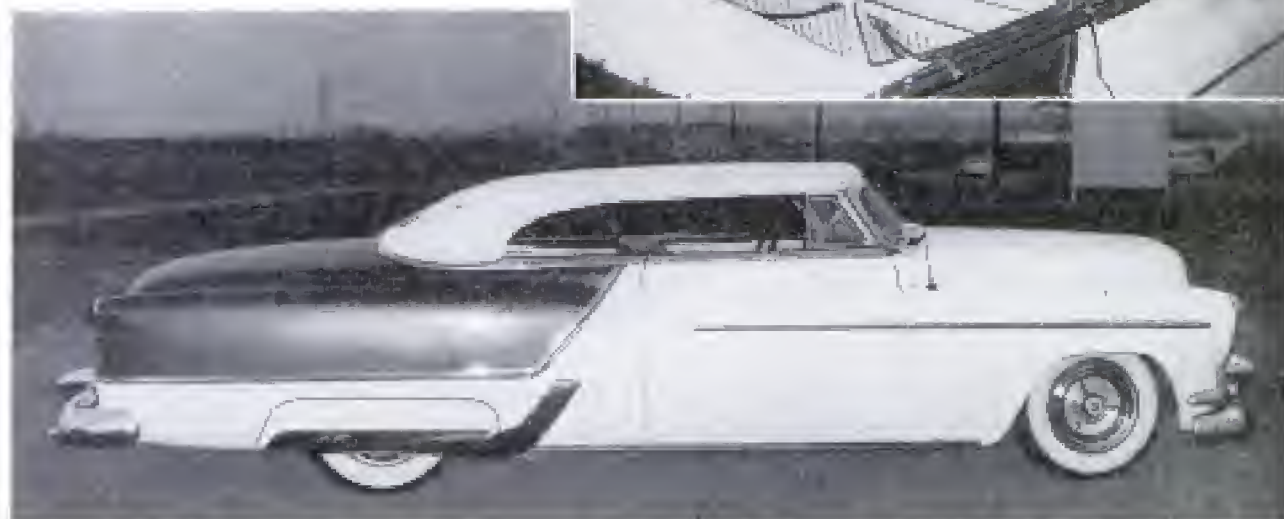
Everett coupe has tubular steel frame, uses the tubing to carry water from engine to rear-mounted radiator





Another Los Angeles custom-car hobbyist, Frank Mann, salvaged a wrecked Crosley as the basis for what he calls "Baby LeSabre." Decorative basketwork is metal screening and is removable to simplify body polishing

Frequently, the cars retain original lines, but with the customized exaggerations. This, of course, is an Oldsmobile, lengthened and lowered. One-piece top is removable. Souped-up engine has two four-throat carburetors



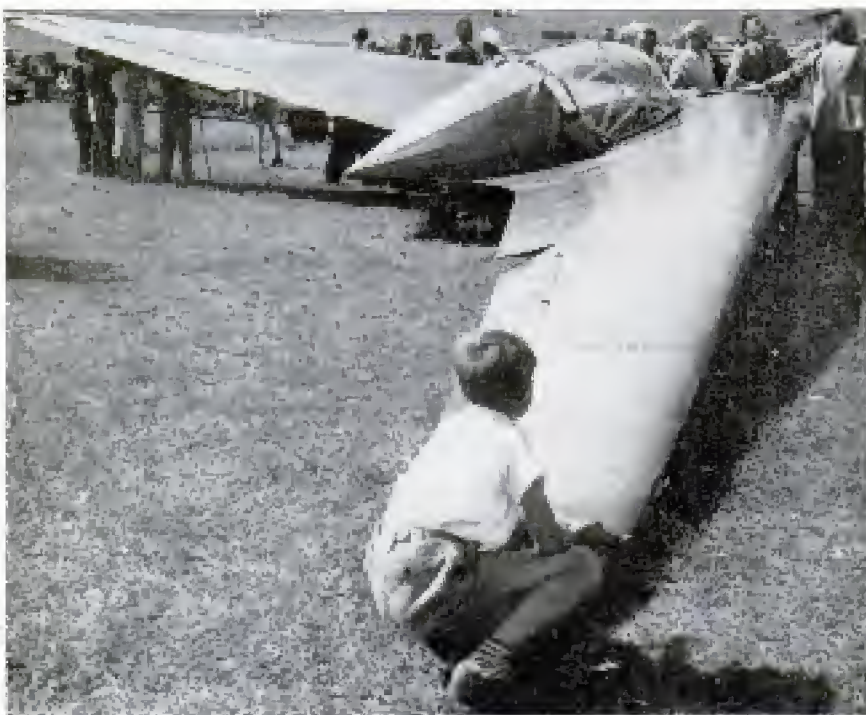
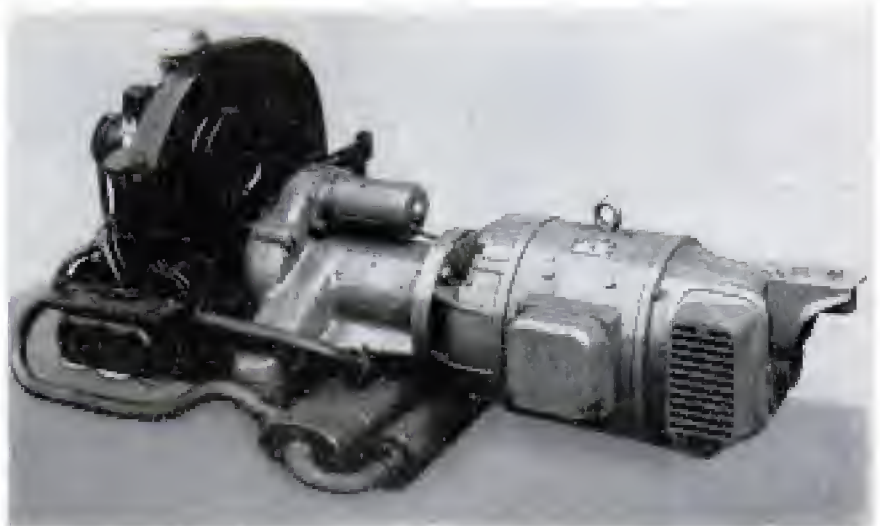
Steel Tube Shrunk by Vacuum to Fit Inside Smaller Tube



Faced with the problem of slipping a 10-foot stainless-steel tube, 12 inches in diameter, over one 12½ inches in diameter, Solar Aircraft Company solved it by using a vacuum technique. The corrugated inner tube and its shroud are used in making augmentors which give forward thrust from exhaust gases. A pump attached to one end of the inner tube shrinks it to about 11⅞ inches. After the outer tube is slipped over it, atmospheric air increases the inner tube to fit the outer shroud.

Auxiliary Motor Runs Trolley Bus

Even when it's off its trolley a new German electric bus keeps on running. A small Volkswagen engine beneath the floor is coupled to an electric generator that supplies power to cross railroad tracks, go around traffic jams and travel to and from car barns without using a trolley line. The auxiliary motor can propel a fully loaded bus.



Tailless German Glider

Seating two, a glider recently demonstrated at Augsburg, Germany, is almost all wing and has no tail. It is said to be the only tailless model flying in Europe today. Gliding, a popular sport in prewar Germany, is once again being revived.

☐ Rutgers University physicist Ira M. Freeman proposes that radioactive wastes be disposed of by shooting them into space or to other planets by rocket instead of burying them in the earth or sea, as is now done.



Grapple and Spot Marker Help Retrieve Lost Fishing Gear

Dismayed fishermen who drop their rods, reels or even motors overboard have a chance of retrieving them if they carry a spot marker and miniature grapple. As soon as equipment is lost the marker is dropped overboard. A sinker carries one end of a line to the bottom and the other

is fastened to a float. The angler then opens up a miniature grapple, drops it overboard on another line and pulls it back and forth across the bottom. With a reasonable amount of luck he'll snag the lost gear and can pull it up. The spot marker and grapple are stored in a canvas bag.

Does Buzzing Bottle Attract Fish? British Anglers Think So

Several British authorities on fishing are enthusiastic about a new "buzzing bottle" which is said to attract fish. J. Grygar, a displaced person now living in Wales, invented the bottle after recalling how his grandfather attracted fish to a boat with a jar of live bees. Grygar built a battery-operated buzzer into a small jar. The an-

gler anchors the boat and sets the jar afloat. The buzzing sound, transmitted through the water, is said to fool fish into believing that insects are on the surface. It's up to the fisherman, of course, to make the catch once the fish are in the vicinity. Does it work? A good many British anglers seem to think so.

Electric Calendar Shows the Day, Date and Month

Three hands revolve on the face of an electric calendar to tell you the day of the week, the date of the month and the month of the year. The clock corrects itself for the 28, 30 and 31-day months and needs adjustment only once in four years—on February 29. Power failures up to eight hours will not affect its accuracy.

Porcelain Patching Kit

Nicks and scratches in porcelain-finished refrigerators, ranges and bathtubs are hidden with a porcelain patching kit for home use. A tube of filler, a bottle of glaze and simple instructions are included in the packet.



Geranium leaves really started
Jake Dyson in business with a profit.
Whether it's geraniums or baby shoes
or fresh-caught fish,

HE'LL DRESS IT IN COPPER



Dyson's daughter proudly wears earrings and pin which her father made from plant leaves

By
John F. Blaney

Artist in copper buffs a pair
of plated 19th century shoes
which will be made into lamps





He also is an artist in hammered copper. The metal in his hand will be transformed into a gleaming ash tray

PICKING MONEY off trees is the business of Jake Dyson, Sacramento, Calif.

A copperplater, Dyson selects leaves from trees and bushes and converts them into gleaming earrings, candleholders and other objects of art. Every tiny vein of each leaf is preserved in a bright coating of copper.

For 30 years Dyson has been copperplating objects, mostly in someone else's shop. Not long ago, striking out on his own, he started copperplating novelty items in his

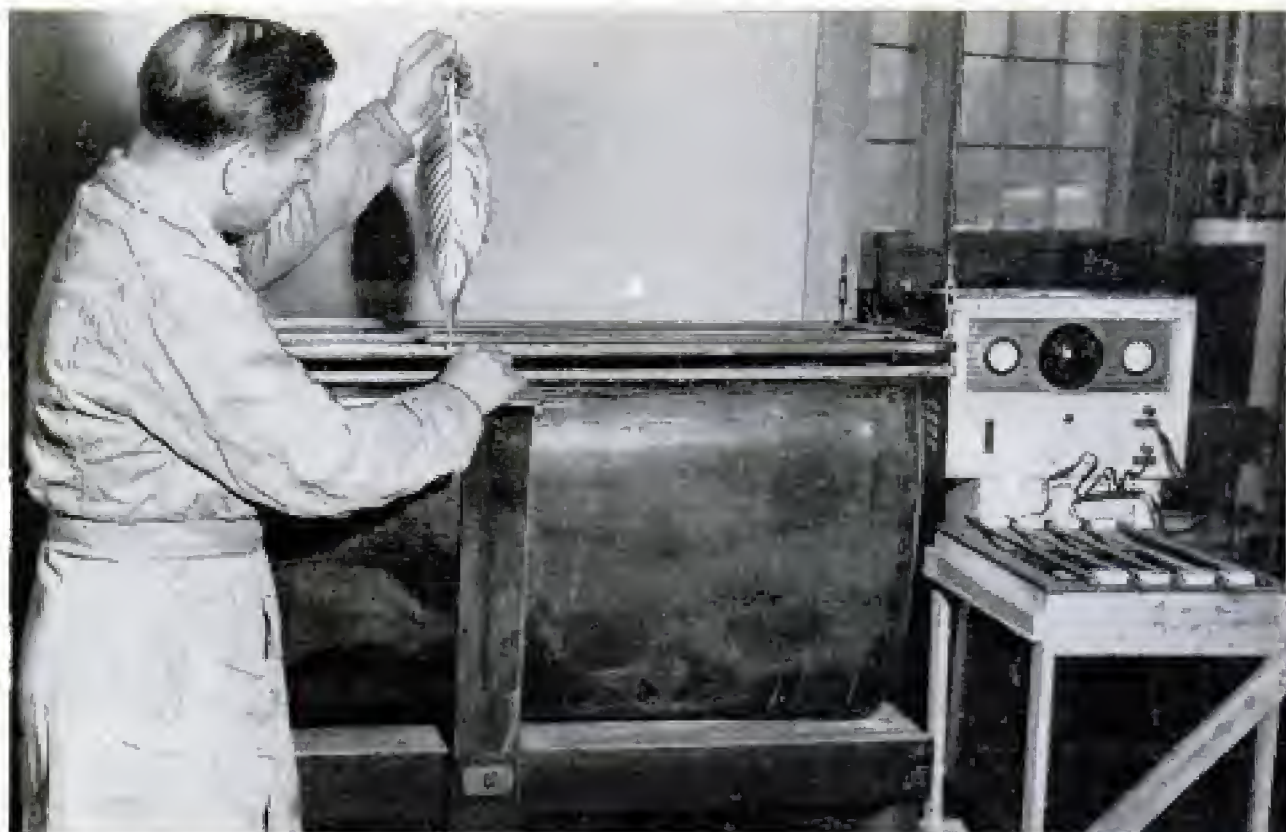
basement. Before long the demand for his work was so great that he had to expand.

Dyson rented larger quarters and started building his own facilities from anything he could find. He located a small electrolysis tank but couldn't find anything suitable for the larger fixing tank he required. Finally he hit upon the idea of using a surplus B-29 wing tank. Its large capacity and rubber-type fabric made it ideal.

Now Dyson will tackle almost anything

Plated leaf shows every tiny vein that appears in natural leaf. Right, Dyson plated the glove of a former boxer





Surplus aircraft wing tank became a large fixing tank in Dyson's shop. Here he checks a copperplated leaf

In his homemade spray booth he sprays a decorative horse's head with copper. Below right, he mounts baby shoes in unique style



in the way of a copperplating job. Gleaming leaves are his specialty. Under his expert hands, tiny geranium leaves become earrings and larger leaves become glistening candleholders.

On special order he also plates such items as boxing gloves, baby shoes and model airplanes. Once he even took on the job of plating a rattlesnake. For a proud fisherman he recently copperplated a prize catch.

Copperplating is just one of Jake Dyson's many talents.

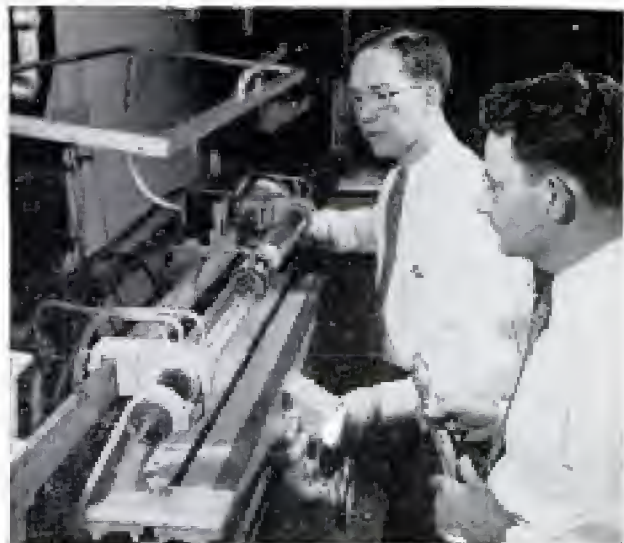
He also makes beautiful hammered-copper items. His specialties in this line are barbecue covers, large plates and unique copper planters. ★ ★ ★



POPULAR MECHANICS

99.99999999 Percent Purity Gained in Metal Process

Metal and other substances can be refined to 99.99999999 percent of purity with a method developed by Bell Telephone Laboratories. The impure fraction is the equivalent of a pinch of salt in 35 freight cars of sugar. A thin strip of germanium to be used in transistors is placed beside a track along which travels a circular electrical heater. As the heater moves down the strip, it produces a molten zone that pushes the impurities to one end of the strip. The impure section is then cut off and discarded. Bell believes the result is the "purest material in existence."



"Million Dollar" Camera Aid for Jets Built From Surplus Parts



Starting with an idea and \$100 worth of surplus parts, Lt. Harlan Williams and Chief J. L. Rains produced what the Navy terms a "million dollar" invention. It is an image-motion compensator that permits sharp, clear pictures to be taken from fast, low-flying jet aircraft. During the split second that the shutter clicks, the device moves the camera slightly to compensate for the airplane's speed of 600 or more miles per hour. The effect is that of shooting from a stable platform. It took Williams, a pilot, and Rains, a metalsmith, both stationed on the aircraft carrier USS *Philippine Sea*, just one week of spare-time work to fashion it from spare parts.

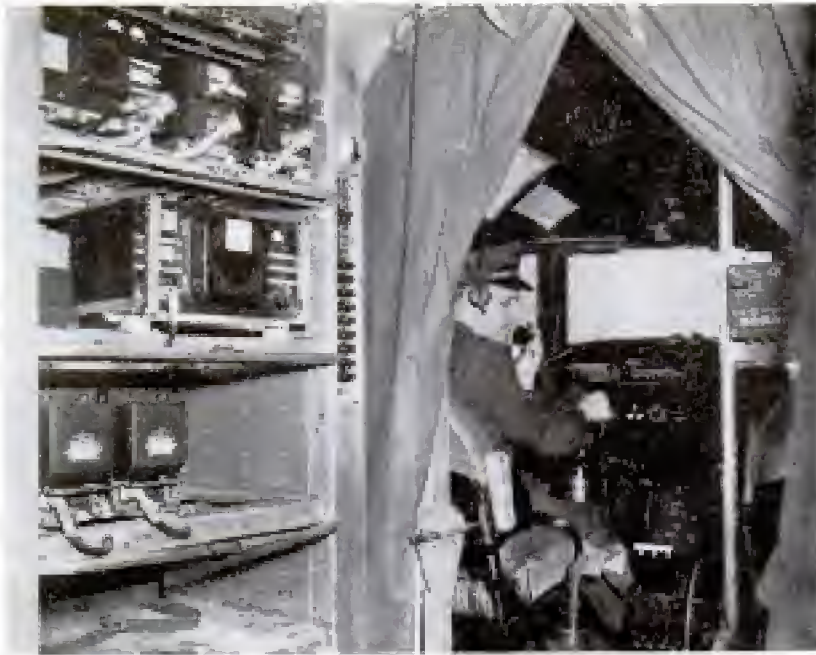
Motor-Driven Master Switch Controls Many Circuits at Once

You can control 25 electrical circuits at once and turn on a preselected pattern of lights in a house equipped with a new motor-driven master switch. Low-voltage remote-control switches located about the house allow you to control the entire lighting system from any of various points. In factories, offices and institutions, the switch can be used to control banks of lights. The 25 circuits on one motor-driven switch can be connected to 25 other motor-driven switches to achieve a one-location control of 625 lighting circuits.

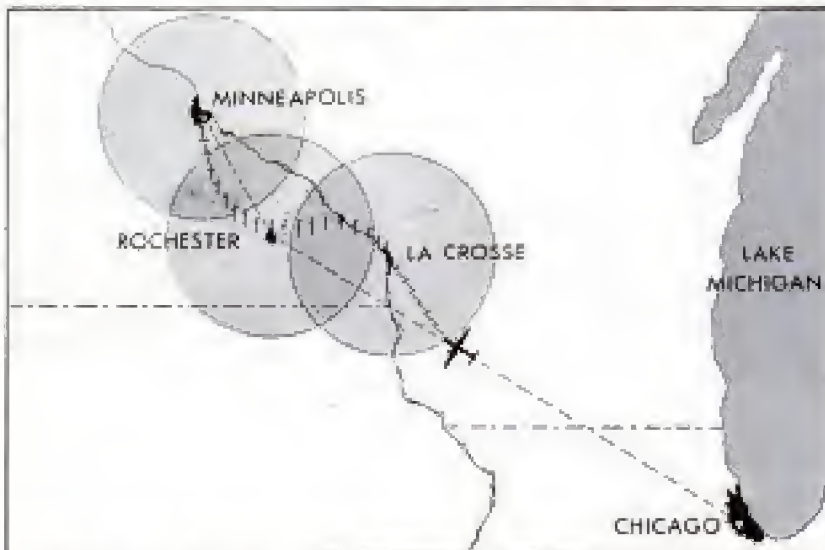
Radar Beams May Be Lethal

Harmful consequences might result from inadvertent exposure to the beams of high-powered airborne radar the Navy will shortly be operating, according to Comdr. Sidney I. Brody. Commander Brody, Navy medical officer, said that in tests cataracts had been produced in the eyes of animals. He urged the use of neon bulbs to warn of the existence of a dangerous field.





In flight, a Northwest pilot checks with Minneapolis over VHF-telephone system. Below, the shaded areas indicate ranges of VHF stations en route



Incoming reports are copied on a teletypewriter for relay to other points. Right, center dial controls primary power to "slave" stations



Pilot Talks to Tower Via Phone-VHF Linkage

THROUGH A combination of long-distance telephone and VHF-radio facilities, pilots of Northwest Orient Airlines now come into voice contact with the Minneapolis tower from approximately 200 miles out. Although VHF is limited to line-of-sight, the system developed by Collins Radio extends it to allow coverage over any distance without the cost of additional operators. Unattended VHF stations at two cities en route, controlled by Minneapolis and connected to it by long-distance telephone, are the links through which communications flow between planes and the home base. On the remainder of the route the pilot has voice contact at all times with Chicago or Madison, Wis. All air-to-ground talk is also copied on teletypewriters and relayed to operational centers en route. When the Minneapolis operator presses a foot switch, transmitters there and at the "slave" stations go on. When he releases the switch, all the transmitters are off and the receivers go on. The remote control is achieved by use of a tone which is transmitted to the stations via telephone lines.

Collins Radio Company photo





British Information Services photo

Jet Pilot Flies on His Stomach in British Experiments

Test flights are being made in England of a prone position for pilots, designed to lessen fatigue and permit fliers to withstand more Gs (force of gravitational pull). It will also permit design of slimmer fuse-

lages. The experimental plane, a Meteor jet, has the prone-position installation in the nose with special controls for the pilot. Another pilot occupies a conventional cockpit during the test.

Thumbtack Tool Drives, Extracts and Stores Supply of Tacks

Thumbtacks are stored in a tiny device that also provides a means of driving and extracting them. One end of the tool is magnetized to hold the tack in various driving positions. At the other end is a small claw that slides under the head of an embedded tack and pops it into the container. A sliding cover permits access to the tack supply. Draftsmen and artists find the tool handy.



Vending-Machine Diner Lets Passengers Serve Themselves

Vending machines replace waiters in the new buffet cars on some Pennsylvania Railroad trains. Six automatic machines offer the passengers several kinds of sandwiches, soft drinks, coffee, ice cream and

other desserts—all at reasonable prices. There are seats for 12 patrons and a stand-up counter. An attendant at the counter mixes beverages and supplies change for the vending machines.



PRECAST CONCRETE HOUSE



Contemporary in design with picture window and roof overhang, this house can be completed in two weeks

SOMETHING NEW in the way of concrete homes is happening almost overnight in the vicinity of Napa, Calif. Twenty-ton cranes swing precast wall and roof sections into place in a few hours. An entire house can be ready for occupancy in two weeks. Buyers are given a choice of the shell house for \$6270 (walls and roof), just the walls for \$4420, or the finished home for \$12,900. The house has three bedrooms and contains 1242 square feet of living

space plus a 480-square-foot garage. There are 84 square feet of closet space, a sliding glass window wall in the dining room, a picture window, fireplace, tile bath and central heating. The walls are one-piece units of steel-reinforced prestressed lightweight concrete six inches thick. Window and door frames, conduit and piping, electrical outlets and switch boxes are cast right into the walls. These walls can be made in lengths up to 40 feet. They are

A 20-ton crane lifts wall section into place. Three workmen plus crane operator can erect shell in half a day





welded to steel base plates in the concrete pier-type foundations. The only joints in the upright walls are in the corners which are welded together at three places with steel plates. Interior corner joints are covered with wood moldings and, on the outside, the corner joinings are caulked and then hidden by downspouts. Slabs for the roof come in precast six-inch-thick units which are welded to the walls and to each other. The four-inch slab floor is attached to precast reinforced steel hooks in the wall to pull the entire house together. Interior walls have a smooth finish which can be painted or papered. Two finishes are available for the exterior walls, either a broom texture or a steel-trowel finish. Four basic floor plans are available, all with three bedrooms. The house was developed as a sideline product by the Basalt Rock Company of Napa, which ordinarily deals in road-construction materials, lightweight-concrete building units and steel pipe. The company has spent several years of research and experimental work on the project. ★ ★ ★

JULY 1954



Workmen prepare to guide one-piece wall section into place. The wall is six inches thick and made of steel-reinforced lightweight concrete. The door and window frames are cast right into the solid wall.



Above, workman is welding a corner joint in the upright walls. The walls are also welded to steel base plates set in the concrete pier-type foundations. Below, as roof panel is lowered by crane, two men ease it into proper position. These roof slabs are six inches thick and are welded to the walls and to each other to form a sturdy home.

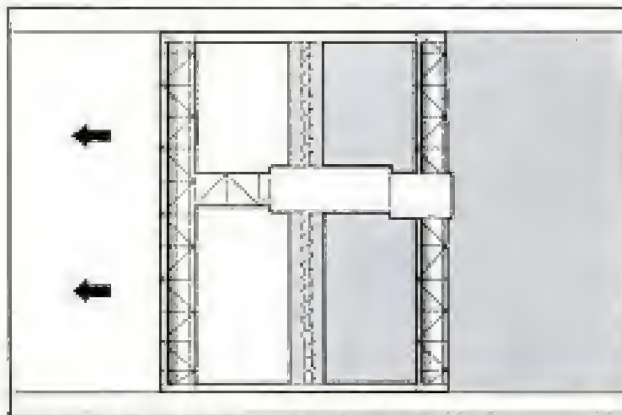


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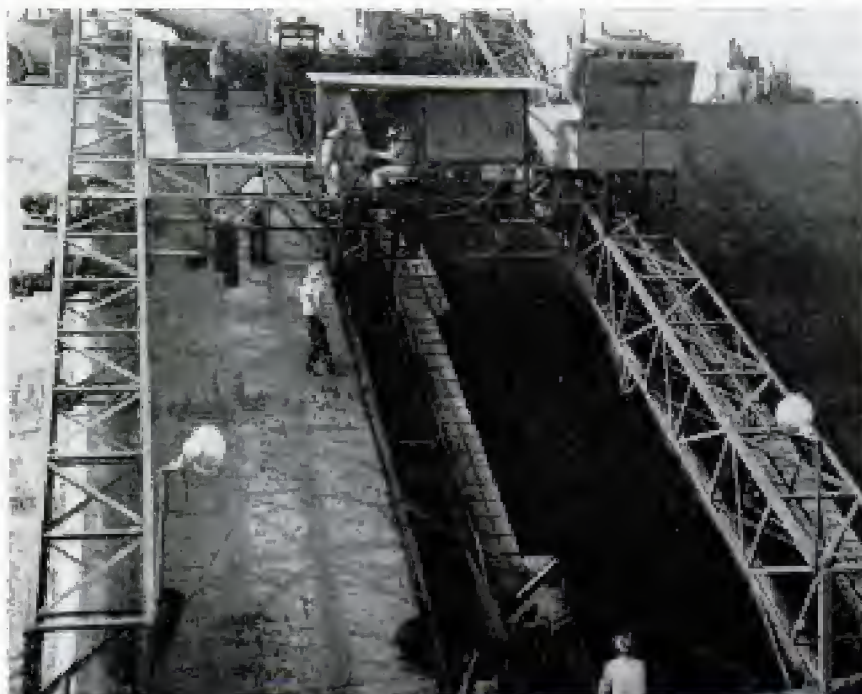
Dump truck unloads hot asphalt into side hopper of paving machine. Up to 800 tons of asphalt are laid per day

Paving Machine With 60-Foot Reach Asphalts Steep Levee Slope



Auger midway between rollers distributes asphalt

Men with hooks lift wire mesh so that it is embedded in center of asphalt



PAVING A STEEP levee slope is a fast process with a 20-ton "land plane" which has a center section suspended from a frame supported by front and rear rollers. Hot asphalt is dumped into a hopper at the top of the levee and is augered into a 60-foot center distributor box. Within this box another screw distributes material evenly down the slope. Hydraulic jacks raise and lower the distributor box as needed to lay a thickness of $3\frac{1}{2}$ inches, which is compacted to three inches by the heavy rear rollers. The entire machine is self-propelled by electric motors attached

to two winches at the forward end, with cables from the winches running to a deadman anchor several hundred feet ahead. Electric power for all motors is furnished by a generator sled-mounted behind a tractor, which also serves as an anchor to keep the machine from sliding down the slope. The machine was designed by contractor Bert Altfillisch for a flood-control job in Long Beach, Calif. It was expected to pay for itself on this first job by reducing labor expense. The machine handles up to 800 tons of hot asphalt per day. Altfillisch contracted for paving 1,664,000 square feet of flood-control channel.

Kodak Introduces Low-Priced Camera, Viewer for Stereo Fans

Breaking into the rapidly growing three-dimension-camera field, Eastman Kodak announces a 35-millimeter stereo camera that sells for less than \$100, one of the lowest priced on the market. The camera has matched color-corrected lenses which are coated for increased light transmission and decreased internal reflections. The shutter has four speeds ranging from $\frac{1}{60}$ s to $\frac{1}{600}$ second. It also has built-in flash synchronization. Double exposures are impossible as the shutter is cocked as the film is advanced. A simplified exposure calculator helps the photographer select the proper lens opening for the light available. Other features include a spirit level built into the camera body, an exposure



counter, a film-type indicator and an automatic film threader. Kodak has also announced a stereo viewer that comes as either a battery model or a 110-volt model.

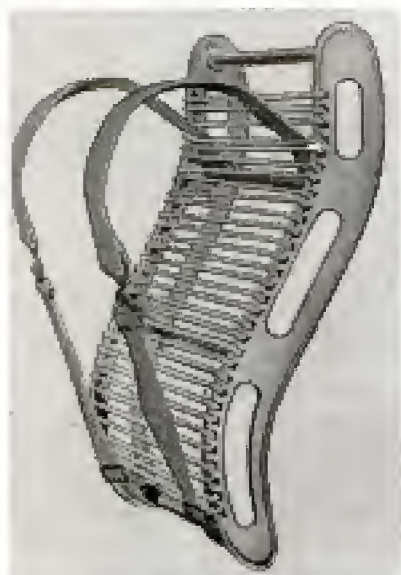
Gold-Plated Windshields

Gold-plated windshields on which ice can't form have been developed for British aircraft. A thin gold film only .0000002 inch thick that is applied beneath the outer layer of the laminated glass conducts electricity to heat the windshield. When military needs are fulfilled, the manufacturer expects to produce similar windshields for automobiles.

Moth Paste Kills and Cleans

Suits, hats and blankets are cleaned and mothproofed with a paste that is diluted in hot water and sponged on the fabric. This is one of two new products of an English chemical firm. The other item is a shampoo for carpets that also acts as a moth-and-germ deterrent. One tube of the shampoo paste, diluted in hot water, cleans 30 square yards of carpet.

Lightweight Aluminum Rack Holds Pack in Comfortable Position



Hiking in hot weather is much more comfortable when your pack is mounted on a sturdy aluminum-alloy rack that is curved to fit your back. The pack rests on heavy cord that is stretched across the rack, leaving an open-air space between pack and back. The 1 $\frac{3}{4}$ -pound rack can be adjusted to fit children or adults. Horseback riders, cyclists and skiers find that the rack balances the pack load for maximum comfort. Hunters use it to carry game bags and gear.

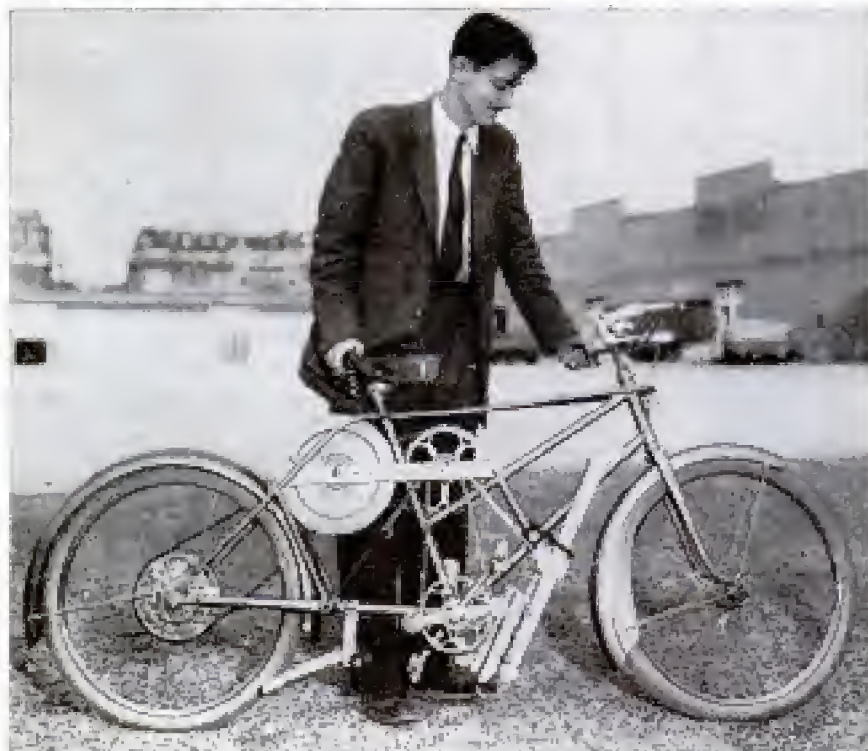


Master System Performs Many Medical Tests at One Time

Many kinds of body functions are tested and recorded at one time by a system developed at Baylor University College of Medicine and Southwestern Poliomyelitis Respiratory Center in Houston, Tex. The apparatus takes down the patient's electrocardiogram, pulse, blood pressure, blood oxygen saturation, speed of breathing, air volume and measures the oxygen, nitrogen and carbon dioxide of the breath. Attach-

ments on the arms, wrists and in the mouth receive the data and feed them into four separate electronic banks. These, in turn, are wired into a central charting mechanism, also electronic, which directs writing pens as they record all the results on one moving piece of graph paper. The conventional method is to record bodily functions separately and then patch them together by guesswork. Cost of the system: \$55,000.

Supergeared French Bike Gives Cyclist Choice of Several Speeds



There's a weird assortment of sprockets and chains incorporated into a supergeared bicycle invented in France. The chains appear to run at random all over the framework of the bicycle, but the arrangement gives the rider a choice of several gears. The bicycle has two-wheel brakes.

Relay Guards Lines

Within $\frac{1}{60}$ second after trouble develops, an electronic "watchman" trips a giant circuit breaker to kill a power line. The electronic relay, which has a vacuum tube as its basic working part, acts as a protective fuse.

Radio Television Electronics

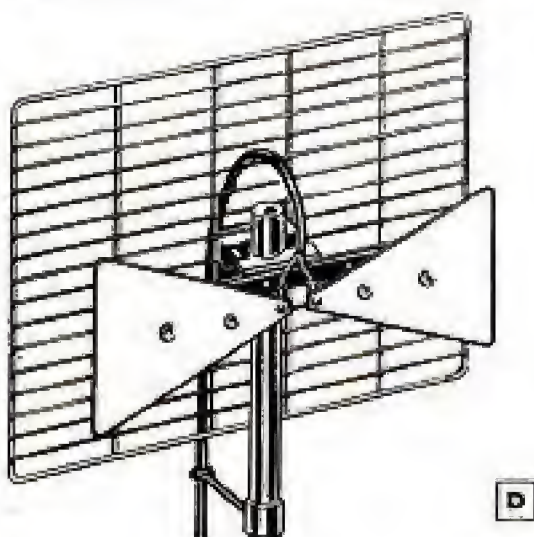
SMALL-TOWN VETERINARIANS MAKE RADIO PAY

THREE PROGRESSIVE Midwestern veterinarians are using a two-way radio system in order to earn more money for fewer hours of work. The trio—Dr. Donald W. Rawson, Dr. William K. Specht and Dr. G. C. Poppenhouse—have built their small-town veterinary practice into a flourishing business with this system that keeps them in constant touch with their office, homes and customers, in a 20-mile radius around Milledgeville, Ill.

Their new office and clinic are shown in photos C and D. The 60-ft. telephone pole in the rear of the building supports the antenna for a Motorola 60-watt FM base station which serves as the heart of the system. Each doctor has a 30-watt 2-way unit in his car. Photo A shows Mrs. Rawson at a remote-control console in the Rawson kitchen, a few blocks from the base station in the clinic. At the flick of a switch she can talk to her husband by radio in his car or by intercom if he is at the clinic. Thus she becomes chief dispatcher when the doctor is out on calls after office hours. In photo B, he answers an emergency call.



HOW TO SELECT YOUR

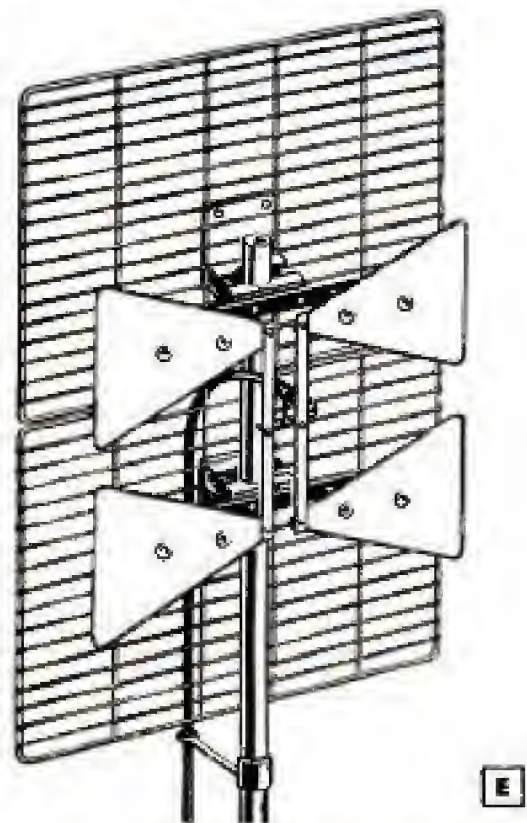


YOUR LOCATION is the deciding factor in choosing the correct type of TV antenna from a wide variety of designs. The new UHF channels 14 to 83 require additional antennas. The long-awaited color-TV programs will require no antenna change, and that is welcome news to many prospective color-television-set owners.

For maximum results, your television-antenna array must be highly selective on the TV channels employed by the stations in your area. If it is not efficient on each channel, it will include scattered and delayed reflected signals and the result is troublesome ghosts. To receive the AM (video) picture and FM (audio) signals head-on at greatest efficiency, it must be cut to favor those particular channels, and correctly oriented in the direction of such stations. If this is not done, the best TV-set tuner made will be handicapped even on strong local stations.

This becomes more important in fringe areas remote from TV-broadcasting stations. Multiple-bay TV-antenna arrays, and specially designed "Yagi"-type multiple parasitic-element arrays are employed to advantage in such areas.

There are about 45 or 50 different VHF and UHF TV-antenna designs available. Each manufacturer uses standard electrical formulas, and supplements these with months and sometimes years of field test-



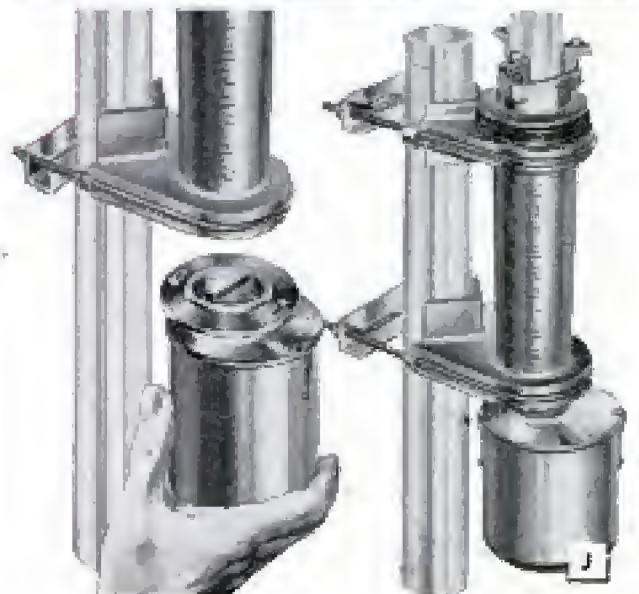
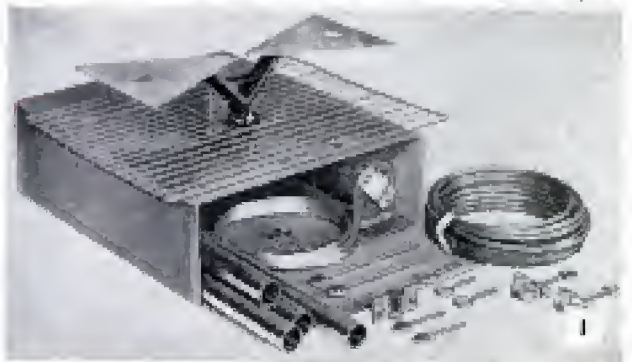
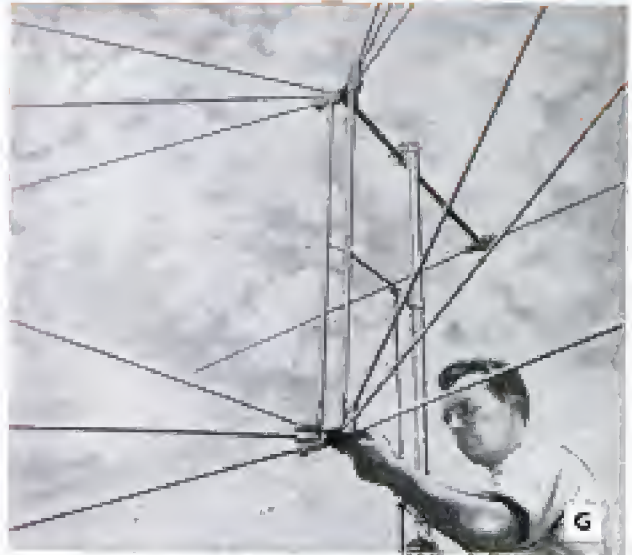
TELEVISION ANTENNA

ing in order to solve specific location receiving problems. Ordinary homemade "plumbing" construction jobs with the difficult to obtain hard-aluminum tubing are not recommended except for the dyed-in-the-wool experimenter.

One of the simplest, and usually sure-fire methods for the new TV-set owner to select an efficient type for his particular location is to visit the neighbors and check up on their results. In some areas you will find a number of different types in use but they will usually follow a general pattern as the TV servicemen have learned by experience just what type gives maximum results in that particular neighborhood. The necessary height is determined by the distance from the transmitting stations, and the topography of the surrounding country. Even though you may be located comparatively near the desired stations, intervening hills and buildings may make it necessary to do some experimenting if you have no near-by neighbors to check with.

The fringe-area TV antenna must be carefully selected to include the desired channels, and if the broadcasting stations are not all located in the same general direction a remotely controlled rotating device, such as the one illustrated in photo J, may be employed to "aim" the antenna array to the desired station. In ultra-fringe

(Continued to page 234)



MATCHED HOME-MUSIC ASSEMBLY

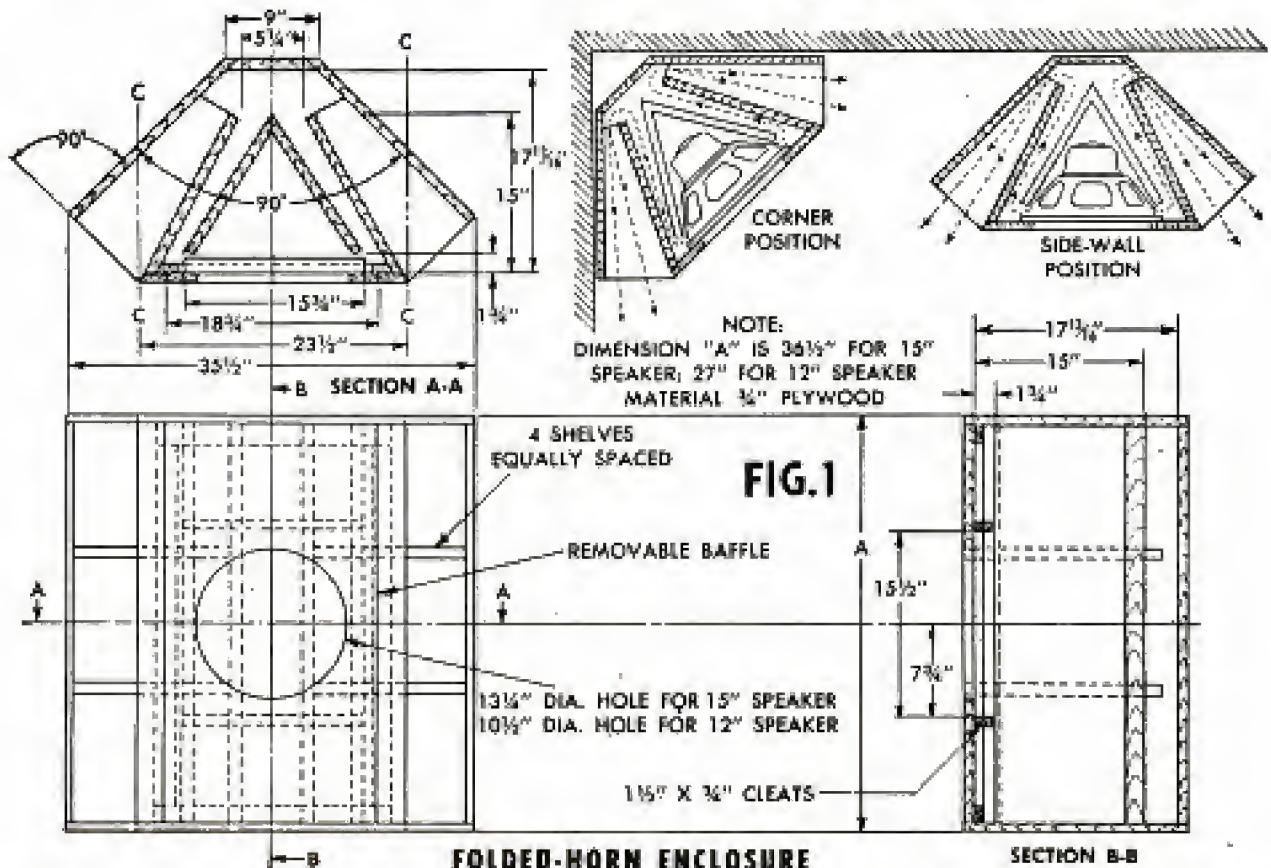


NOW YOU CAN purchase a complete home-music system in a packaged assembly, known as the Craftsmen CA1, and install it in any custom-type equipment cabinet of your choice. All the units, photos A to E, are provided in a single carton, complete with a changer mounting board, all necessary connecting cables, photo E, and mounting hardware.

The 12-in. speaker system, photo A, is a high-fidelity specially designed type which includes a wide-angle dispersion, horn-loaded tweeter which is coaxially mounted in a 12-in. woofer for single point sound distribution.

Photo F shows a suggested folded-horn enclosure for the speaker; this is detailed in Fig. 1. The C-400 high-fidelity 10-watt amplifier, photo B, employs two 6V6 output tubes in push-pull. The Craftsmen type C10 FM-AM tuner, illustrated in photo C, is a popular model used in many home-music systems.

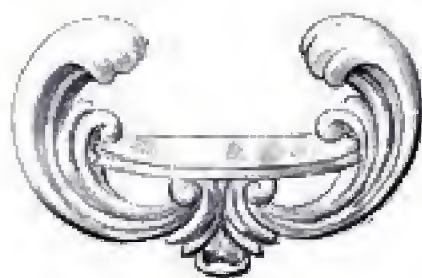
A three-speed automatic record changer is included. This unit, shown in photo D, is complete with a GE "Triple play" phono pickup cartridge. The assembly gives the high-fidelity amateur a carefully matched home-music system.



the

POPULAR
MECHANICS

CRAFTSMAN



By John Bergen

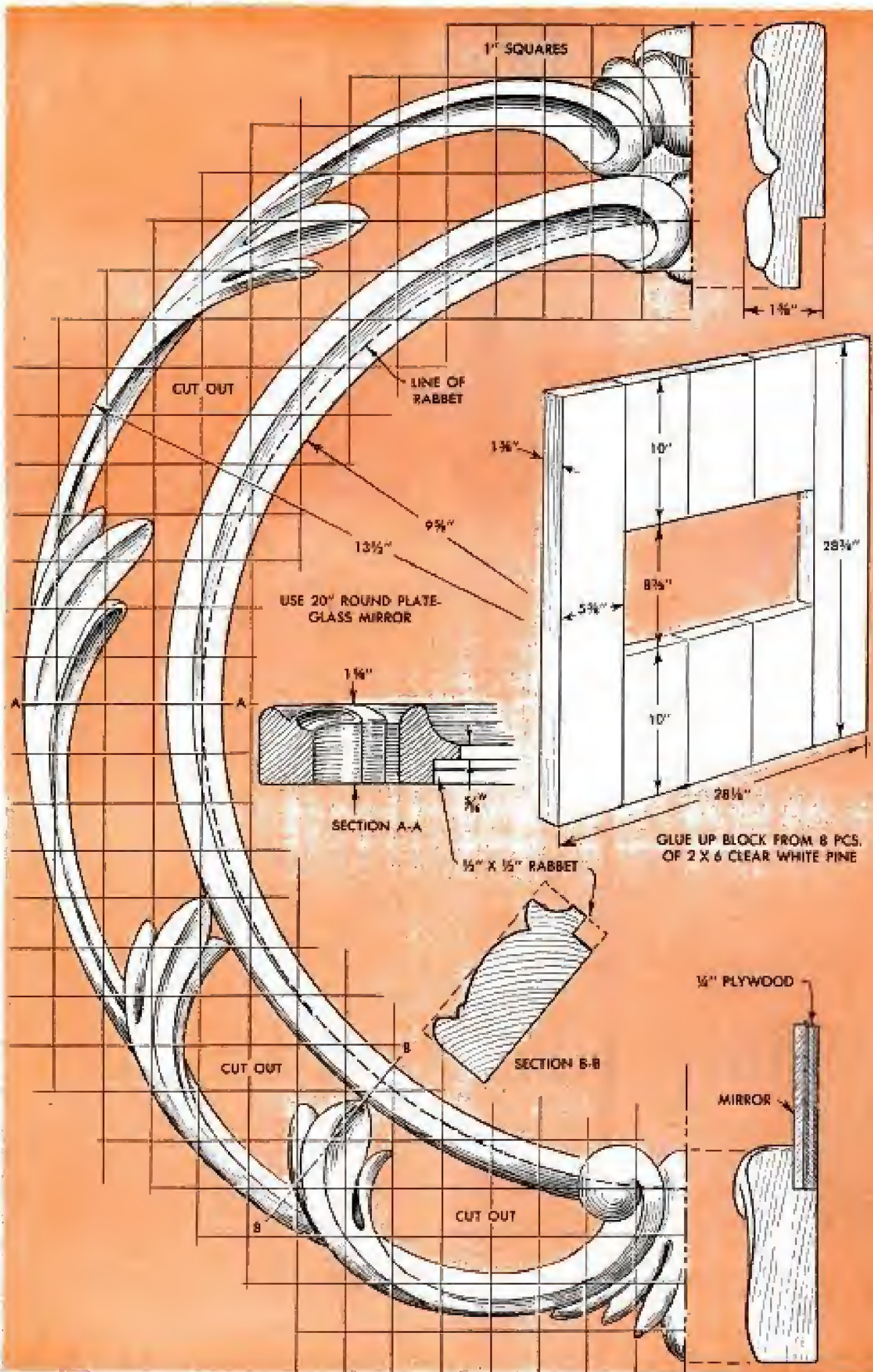


Hand-Carved MIRROR FRAMES and SHELVES

GRACEFULLY CARVED in bas-relief from soft pine and finished in bone white antiqued with gold, these classic-looking mirror frames and shelves will add an interesting and distinctive touch to the walls of your living room or hall. The carving is not as difficult as it may look. The work is simplified to a great extent by rough-sawing the scroll and leaf outlines beforehand. Thus, the carving is limited to the actual surface shaping of the leaf design.

The steps in making the pierced circular

frame pictured above are the same for making the shelves. In each case, the frame is rough-sawed from a built-up blank of 2 x 6 clear white pine. However, your first job is to make a full-size pattern of the design. Actually, only half of the complete pattern need be drawn as it can be duplicated by merely flipping it over and tracing through from the reverse side to form the complete pattern. To enlarge the magazine pattern given on the following page, rule off on paper the same number of squares

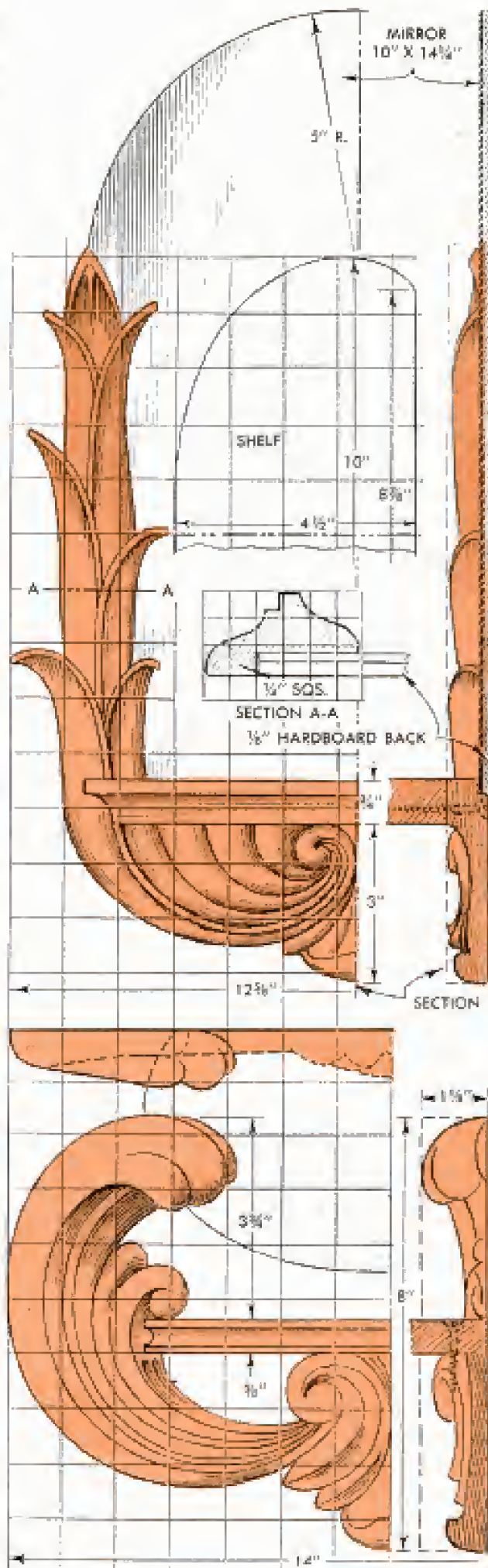


as indicated, drawing 1-in. squares. Number the squares across the top of your paper and down along one side and number the squares on the magazine page in the same numerical order. These numbers will help in spotting the design in each corresponding square. Enlarging a pattern by the square method if you haven't done it before, involves little more than duplicating in each square of your ruled paper the portion of the design that falls in the same square of the magazine drawing. If you are careful in following the same curvature of line in each corresponding square, you'll have a perfect full-size pattern.

Over-all size of the glued-up blank is given on the facing page. Divide the blank in half with a center line and then transfer the full-size pattern to the work, tracing first one half and flipping the pattern over to complete the other half. Small tabs of cellulose tape are handy to keep the pattern in position while tracing. In rough-sawing the frame to line, it will require a jigsaw to make the inside cuts. Use a fairly coarse blade and give it time to cut.

Next, the frame is rabbeted to take the mirror and backing. The rabbet is indicated by a dotted line and its size is given in section A-A. It should be cut on a shaper, or with a router fitted with a rabbeting bit. This can be done before sawing the pattern, if desired. Now, attach the cutout to a piece of plywood with small screws driven through from the back of the plywood into the thicker parts of the cutout. Most of the carving is done with a carver's gouge of wide, flat sweep. Note the relief in sections A-A, B-B, also sections at the top and bottom of the frame. The trick in carving designs of the type detailed is to remove waste in a series of very light scoop cuts, working always with the grain. At the rounded ends of the concave forms the cuts should be very short to avoid lifting a long splinter. The carver's gouge must be ground, boned and leather-stropped to a razor edge. Vertical cuts at the ends of the concave sweeps are made with a carver's corner chisel, which is similar to a lathe skew chisel. Run straight down with the corner chisel so that the chips from the concave cut will break off square without following the grain of the wood past the point desired.

Ordinarily, carvings are never sanded unless the work is to be enameled or finished with gold leaf. Otherwise stain, apply wax and polish lightly with a soft-bristle brush. If desired, a small quantity of rottenstone can be added to the wax before applying. This gives the wood a grayish tone which is quite attractive. When fitting the mirror be sure to cut the backing piece slightly undersize. ★ ★ ★

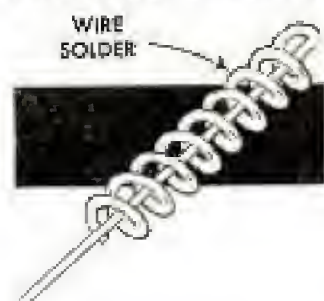


Authentic Look Given Model-Boat Sails With Aid of Electric Fan



The realistic shape of wind-filled sails on a ship model is easily produced by spraying on sail-stiffening solution while the sails are bellied in the breeze of an electric fan. The stiffening solution consists of either starch or glue mixed with water, or shellac thinned with alcohol. Cover the hull and fittings of the model while spraying to prevent them from staining.

Working Handle for Wire Solder Prevents Burned Fingers



A handle wound from the wire itself will prevent wire solder from becoming too hot to hold while soldering. Wrap a suitable length, 2 or 3 ft., around a pencil, then pull off the coils. Pass

one end of the wire through the center of the turns. The solder now can be held around the loops and worked close to the torch or iron without danger of burned fingers. Additional solder is supplied by pulling the end through the coils.

Henry Josephs, Sarasota, Fla.

Darkroom Should be Painted In Proper Colors

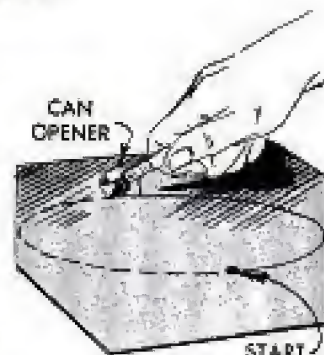
Photographic darkrooms should be painted a color that is not harmful to the developing procedure. If the darkroom is used only for printing, it should be painted a red, orange or yellow. These colors

absorb the violet, blue and green rays of light, which are the rays that fog your paper. A darkroom used specifically for negative processing of panchromatic films can be painted a green tone. Green absorbs the red and blue light rays that affect panchromatic film, causing fog.

Robert C. Florian, Cicero, Ill.

Can Opener Cuts Small Hole In Light Sheet Metal

A round or irregular hole frequently can be cut in light sheet metal with a knife-type can opener more easily than with regular metal shears. Shears require that the metal on one side of the cut be lifted, a difficult thing to do when cutting a small hole. To use the can opener, punch a hole,



insert the opener and cut back to the hole.

W. F. Schaphorst, Newark, N. J.

Clips Provide Thread Strength On Light-Gauge Sheet Steel

When sheet-metal screws must be used to assemble aluminum or light-gauge sheet steel, steel clips should be used to provide adequate thread strength. The clips are rectangles of heavy-gauge sheet steel, folded in half and slipped over the edge of the aluminum. The holes for the screws then are drilled through the clips and the aluminum. The clips also may be used on a sheet-metal assembly where the original holes have become oversized.



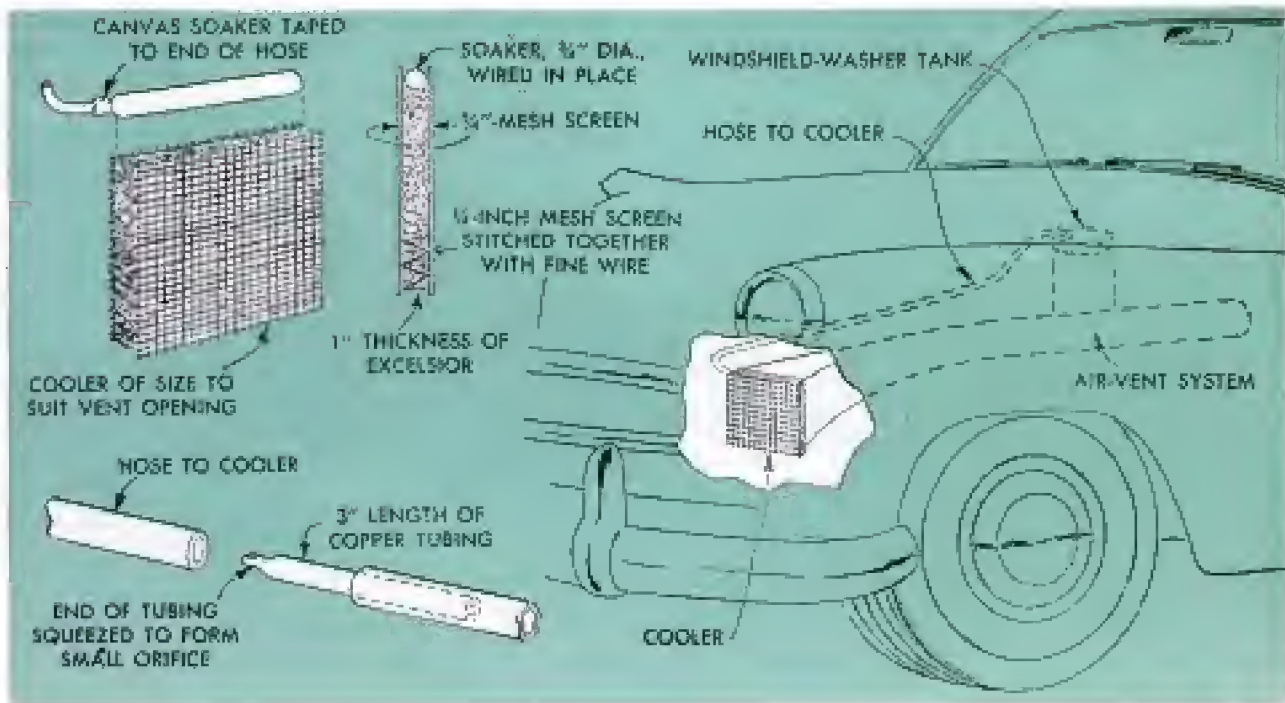


Built-In Air Cooler for Your Car

IF YOUR CAR is vented by sheet-metal tubes leading from the grille and also has a windshield washer, an evaporative-type cooler can be installed in one of the tubes as pictured. Evaporative coolers are ineffective on humid days, but are quite effective on hot days when the humidity is low. As shown in the detail, the windshield washer is used to supply water through a length of hose to the $\frac{3}{4}$ -in.-dia. canvas soaker which rests on top of the cooling element. This is a 1-in. mat of excelsior, sandwiched between two pieces of $\frac{1}{4}$ -in.-

mesh screen, which is cut to fit the vent opening and wired in place.

The installed unit should be tested with the car standing still. With the motor running, press the washer button on the dashboard. If water floods the cooler, cut the hose at some point and install a 3-in. length of copper tubing. Squeeze one end of the tubing partly shut and repeat the test. Adjust the size of the opening in the tubing until water just drips from the soaker into the cooler. Remember to check the water in the tank frequently when using the cooler.



Knockdown Pier for Summer Cottage

By William Spencer Bowen



Note how the pier deck planks rest on stringers—three to each section. The ends of the stringers are supported by the post-assembly cross members, and the two outer stringers are lashed tightly against the posts.

These young men set up a 3-section pier in just 50 min., including the time required to remove the pier members from storage in a boathouse. Either rocks, as shown, or short posts support beach end of pier.

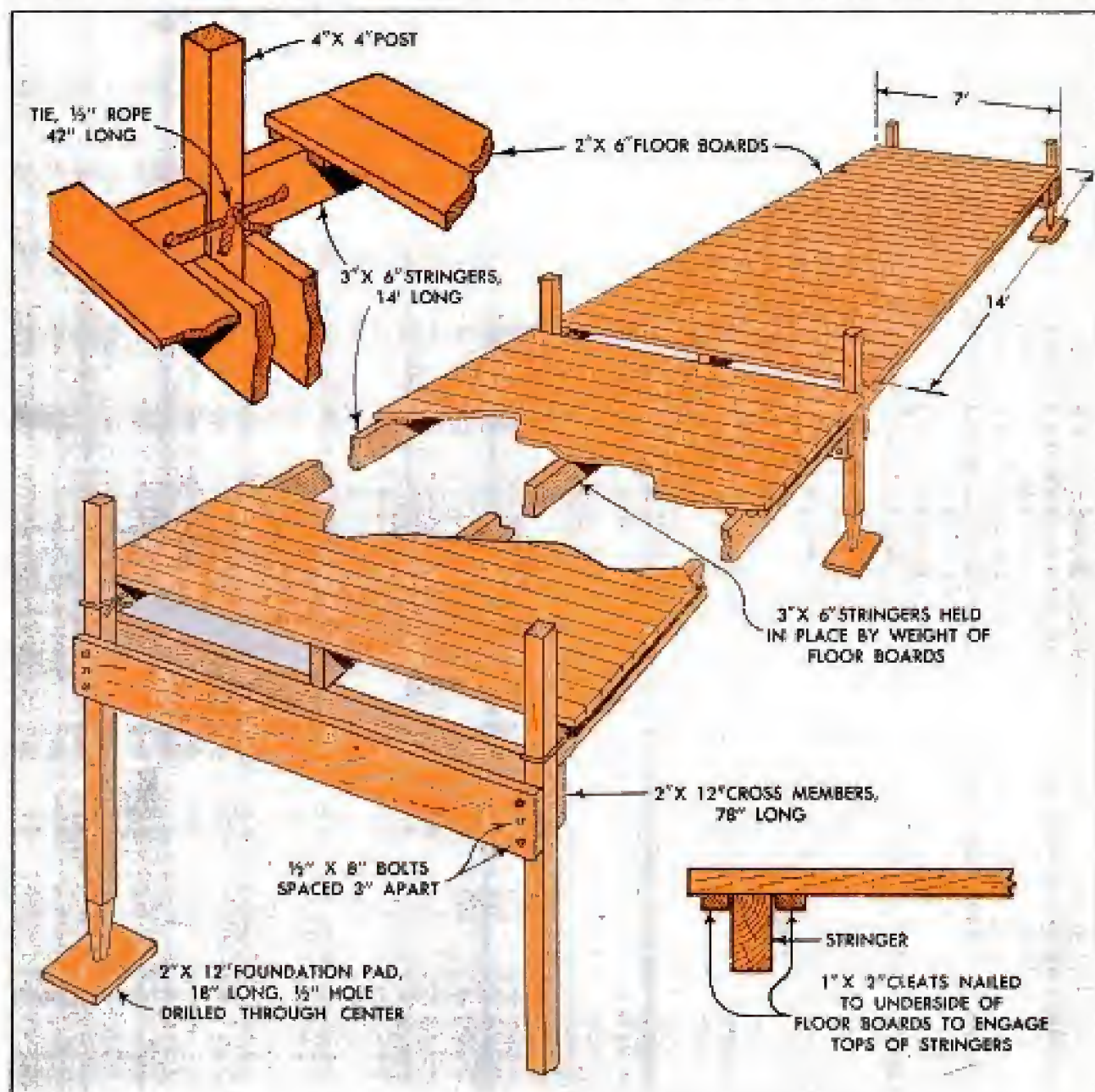
BUILT IN 14-FT. SECTIONS, this lake-beach pier can be set up or dismantled in less than an hour. For years of extra usefulness, it can be stored under cover during the winter months. The sections are supported by pairs of 4 x 4-in. posts, as shown in the detail, each pair of posts being bolted permanently to two 2 x 12-in. cross members. The lower ends of the posts are tapered roughly to a ½-in. point. Thus, if the beach is rocky, the pointed ends of the posts will better penetrate between the rocks. Or, if the beach has a mud or sand bottom, each post can be set in a ½-in. hole drilled in the center of an 18-in. foundation pad cut from 2 x 12-in. lumber.

The ends of the deck planks are supported by 14-ft. stringers tied to the posts, and the center is supported by a third stringer held in place only by the weight of the planks. Note in the lower right-hand detail that cleats are nailed to the undersides of the deck planks to engage the tops of the side stringers. When determining the lengths of the posts, be sure that there will be enough clearance below the planking for normal wave action. Otherwise the planks may be lifted out of position. To keep the planks from warping, coat both sides with spar varnish. The pieces of the pier sections can be floated out when setting up the pier and floated back to shore when it is dismantled, eliminating the chore of carrying the lumber. ★ ★ ★





An hour before this boat pulled up to the knockdown pier, all the pieces of the pier were still in storage



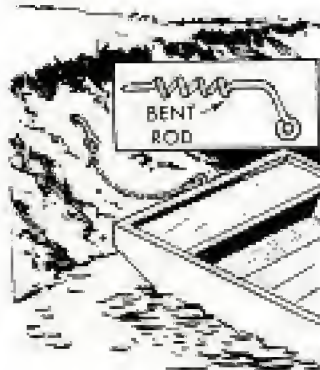
Large Window Fan Controlled By Refrigerator-Defroster Unit



Running the window fan after midnight one home craftsman found, was not necessary to keep the house cool, so he utilized the plug-in automatic-defrosting device from the refrigerator to control the running time. The defrosting unit regulates the fan to shut off after midnight for one, two or three hours. At the predetermined time the fan starts again and runs for two or three hours before time for the family to arise in the morning.

Mrs. Lewis C. Rudd, Kansas City, Mo.

Corkscrew Rod Anchors Boat In River Bank



When a river fisherman wants to tie up at shore, a dock, tree or post is not always available to which he can anchor his boat. One fisherman solved this problem by bending an iron rod as shown in the detail. Then, using

the "handle" on the end of the rod, he forces the corkscrew end of the rod into the soft earth of the bank, after which he secures the tie rope to the eye in the end of the rod.

Prevent Paint Skinning

The amateur painter who works only in evenings and over week ends usually finds the paint "skinned over" when he returns to it the next day. To prevent this, simply float a thin film of turpentine on the surface of the paint and then crimp a piece of

household aluminum foil around the top of the can. This airtight seal will prevent skinning over and the turpentine can be stirred in when the paint is to be used.

Dik Warren Twedt, Wilmette, Ill.

Full-Size Mower Cut in Half Provides Lawn Trimmer

A regular lawn mower cut in half does an excellent job of trimming and mowing along fences, around flower beds and other places where a full-size mower would be awkward to use. After cutting the mower in half,



half, a welded bracket of flat and angle steel is made to support the reel, cutter bar, roller and cross bar. The flat-steel fork of the handle is reshaped so the handle is moved to one side and closer to the wheel.

Linked Fishing Snaps and Swivels Make Strong Watch Chain

A watch or key chain much stronger than the ordinary variety may be made by linking together a sufficient number of swivels and snaps of the type ordinarily used for fishing tackle. For the fisherman such chains, in addition to being attractive and inexpensive, have another advantage. When the last snap is gone from his tackle box and the nearest tackle store is some distance away, he can borrow one from the chain.—John Krill, North Lima, Ohio.



WTM 56 + SN 56

Dehumidifier Makes Basement More Livable

If high humidity is a problem in your basement and the cost makes an electric dehumidifier out of the question, a calcium-chloride dehumidifier is a relatively inexpensive solution to the problem. While not as clean or effective as the electric type, the calcium-chloride type will remove considerable moisture from the air, depending on its size. Capacity of the one shown is 1 to 2 gals. per day.

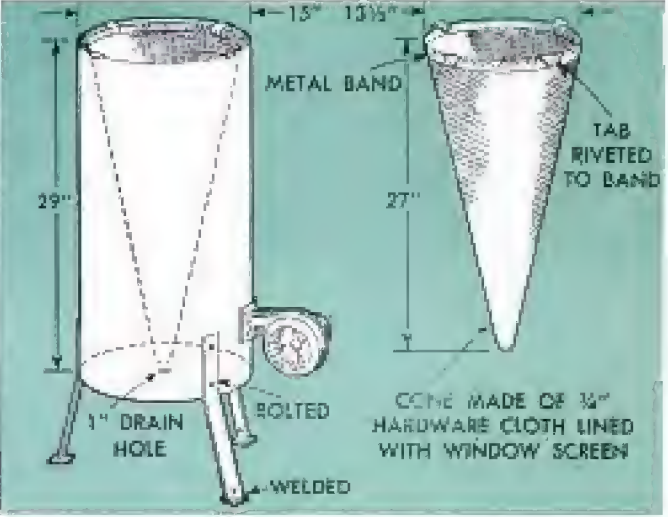
In use, the fan circulates air through the calcium chloride, which is contained in a screen cone, and out the top of the dehumidifier. As the air passes through the chloride, moisture is absorbed by the chemical, which slowly dissolves and changes to a liquid as it reaches the saturation point. This liquid drops from the lower end of the cone into a container or, still better, a rubber tube which carries it to a drain. Since the liquid is slightly corrosive, do not get it on your clothing.

Your local tinsmith can make the galvanized sheet-metal container to the dimensions given. The cone-shaped container is suspended inside the metal container from the top. The fan, which is available from most refrigerator-supply dealers, is about 1/2 h.p., and is bolted to the container, using a rubber gasket to help absorb vibration.



If a single gasket does not quiet the fan, it may be necessary to enlarge the bolt holes in the container and use gaskets under the nuts also. If the holes are enlarged, be sure the fan is mounted so that the bolts do not touch the sides of the holes, which would transmit the vibration to the container.

Grover Brinkman, Okawville, Ill.



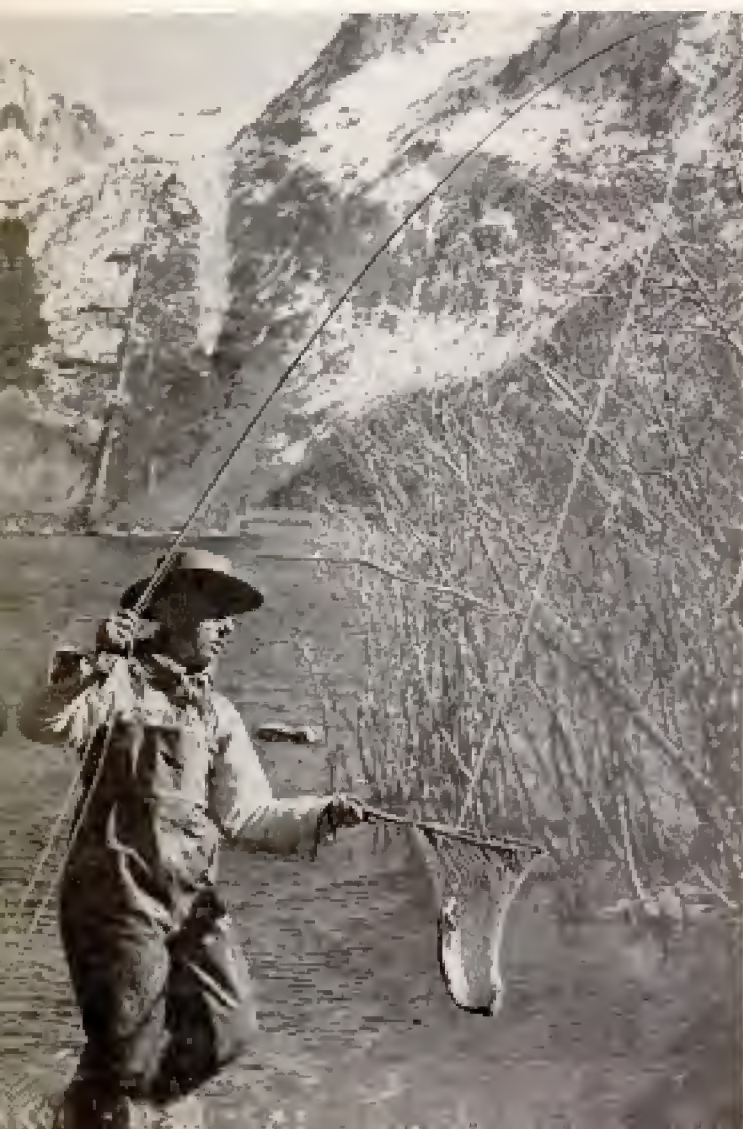
Paper Plate Taped to Paint Can Provides Nontipping Base

Taping a paper plate to the bottom of a paint can will add three advantages to the usual one of preventing paint from dripping on the floor. First, the plate is always in place under the can. Second, both plate and paint may be moved with one hand while a paintbrush is held in the other. Third, the paint is less likely to be accidentally upset, because the plate will act as a wide base for the can. Masking tape is the easiest and most practical type of material to use for this purpose.





Finish of forward cast in fly casting. Loop of line has just been released to shoot fly farther out. Shooting the line takes a lot of diligent practice



PRACTICE for BETTER FISHING

By Claude M. Kreider
and Ray Chapin

IT TAKES SKILL to drop a fly naturally onto trout or bass waters, or pop a heavy lure out among the lily pads where a notional old lunker may be lurking. You acquire the necessary skill by diligent practice with balanced tackle. In general, if you're a beginner, practice for distance first, then refine the technique until you can drop a fly into a 30-in. circle at 50 ft., or spin a lure into the same space from 75 ft. With a plug rod, a good caster will score two out of three bull's-eyes from 80 ft. or more.

Balanced tackle means a matched rod, reel and line for a given purpose. Lures also can be included for purposes of comparison as tackle and lures will be selected for the fish you expect to take. However, there is some flexibility in selection. For example, bass tackle often is suitable for taking trout and pan fish and a trout rod

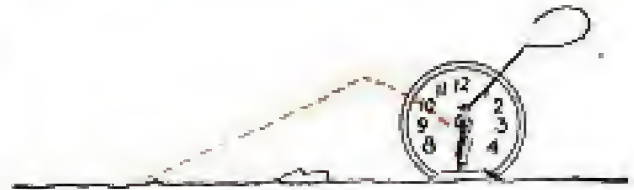
can be used for other species of fish under most conditions.

Practice can be carried out almost anywhere there is sufficient space, on the lawn or over a farm pond or park lake. You may find it advantageous to join a club where organized casting-practice events are held regularly in the off-seasons. At these events you can get helpful guidance from experienced fishermen in the mechanics of casting artificial lures with light tackle. If you prefer to acquire the basic fundamentals and a bit of polish before venturing into an event, then work out on the lawn at the start. Use an old bicycle-wheel rim as a target. Whether you work with a fly rod or a bait rod, the basic procedure is much the same. On the bait rod the reel is mounted above the hand grip, while on the fly rod it is below the hand grip, as in the photo at the right. In bait casting, the reel plays an important part as correct thumbing is necessary in obtaining distance and accuracy. Use a multiplying, level-wind reel on a bait rod.

The cast is made with a wrist snap with the elbow held close to the side. Note the position of the rod and line in the four views at the right. These picture the vertical bait cast with a lure weighing from $\frac{1}{2}$ to $\frac{3}{4}$ oz. and a bait rod $5\frac{1}{2}$ to 6 ft. in length, using a line of from 8 to 12-lb. test. Rod movement is from 10 to 1 o'clock, the movement, or swing, beginning at 10 and ending at approximately 10 on the clock dial, which is used for purposes of illustration. The rod comes up slowly from 10 to 1 o'clock as in the first and second views. Power for the forward movement, or cast, is imparted by wrist action and is applied just as the weight of the plug flexes the rod after the line straightens on the back half of the cast. On the forward cast, thumbing the reel keeps slack out of the line, controls distance and to some extent accuracy. A smooth rhythm in all the movements does the trick. Sudden jerks or a hard forward whip may loop the line and also throw the aim of the cast far off the target. Work with the target fairly close at first, then gradually increase the distance until you are throwing a plug 75 ft. or more. After you become fairly proficient, try working over still water, using the wheel rim or an old auto tire as a target. You will find that working over water is somewhat more difficult due to the changed light conditions, also the problem of estimating distance over water. Stick to the overhead cast. The side cast is permissible when bait casting from a boat, or when it's necessary to get distance against the wind. However, most bait casters will recommend that you practice the overhead cast consistently for hair-line accuracy. Overhead casting results in



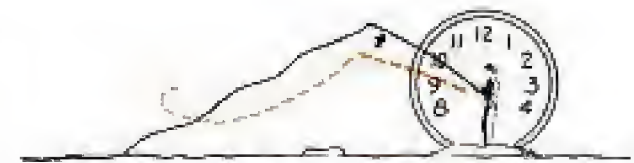
First step in fly or bait casting, using the overhead cast. Rod at 10 o'clock lifts line from water



Back cast completed with rod at 1 o'clock. Line is straightening. Rod is held ready for forward snap



Forward cast completed and line straightening out over water. Note position of rod on the clock dial

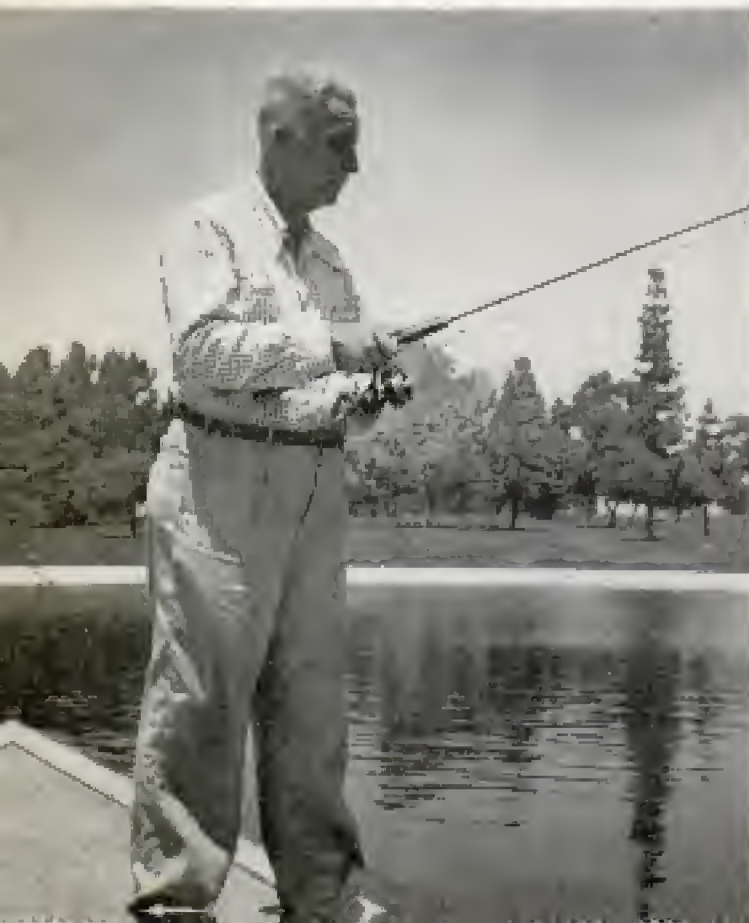


Lure has dropped into water and line is going slack. At this point retrieve is started. Below, two types of fly reels. Note that reels are below rod grip





Above, lake fishing with fly requires a slow retrieve. Some fishermen retrieve the line in the left hand as shown. Below, the technique of spin-casting can be learned in a few minutes at a park pool or at home



less trouble with looping and backlashing of the line under difficult stream and lake conditions, or when handling deep-running plugs and certain types of wobblers and spoons.

In plug casting, the weight of the lure at the rod tip flexes the rod and builds up its drive, or propelling, power.

In fly casting, weight is built up in the line rather than in the lure. In fly tackle, balance means the relation of line weight to the length and power of the rod. A 9-ft. fly rod, weighing from 5 to 6 oz. is an all-around choice but, of course, individual preferences and special requirements will vary the choice. A good fly rod requires a line to fit. A fairly stiff rod will handle a level line of size B or C, the latter being the smaller; about .050 diameter. For best results a stiff fly rod should be teamed with a double-taper line, usually designated HCH, in which the heavy section serves to flex the rod properly on the back cast, while the lighter end, .025 diameter, insures extreme accuracy and delicacy in dropping the fly.

A third type of fly line, having what is known among fly fishermen as a "torpedo head," is popular for handling large flies, poppers and small lures for bass and pan fish; also when wet-fly fishing for trout. This line is essential for long-distance casting. On a 9-ft. rod of stiff action the torpedo line should be of GAF or GBF size. The

Reel in the left hand is level-wind type used by bait casters where free-running and fast-retrieve features are essential. Reel held in the right hand is a single-action fly reel. It weighs only 4 oz.



middle letter, A or B, indicates that approximately 20 ft. of A or B-size line is well toward the forward end so that its weight will flex the rod. The F portion is the running line, while the point, tapering down to the leader, is G-size. Fly lines are of braided oiled silk or nylon, thoroughly waterproofed and polished for smooth running. Be sure that the line size fits your rod. A light fly rod may require a level D line, a double-taper HDH, or even a line as light as the E-size for best results.

The fly reel is single action, made as light as practicable, as a heavy reel gives a pendulum effect and slows rod action. The reel is a relatively unimportant item of fly tackle, serving only as a line holder in average work. Some fly fishermen prefer an automatic reel which winds automatically at the touch of a finger. Its principal advantage lies in its ability to take up slack quickly when playing a fish.

In practice fly casting, start with about 30 ft. of line beyond the rod tip. Generally it's best to work over water right from the start. With the line out, raise it from the water with a fairly sharp snap of the wrist, bringing the rod back overhead to the 1-o'clock position. Hold until the line straightens and the rod flexes slightly. Start the forward cast instantly with a quick snap of the wrist. Follow through, stopping with the rod at approximately 10 o'clock. Just as in bait casting, the important thing in this maneuver is to wait until the rod flexes before starting the forward cast. If you start the forward swing too quickly you may snap the fly off the leader. Some beginners get the feel of the rod more quickly by making only the backward cast repetitively until they can time the forward cast perfectly. When whipping a fly over difficult streams expert fly fishermen often strip off 6 to 10 ft. of line from the reel, holding this in loose coils in the left hand. Just as the line straightens on the forward cast, this slack is fed into the line, thus shooting the fly 6 or 8 ft. farther. It's a neat trick and requires a lot of practice, but it's a big help in getting the fly into a trout pool underneath, low, overhanging tree branches.

Spinning tackle probably comes the nearest to being the ideal all-around gear for fresh-water fishing. Spin-fishing requires use of a light, whippy rod of 7 to 8 ft. length and a spinning reel of the fixed-spool type. Light braided nylon or silk lines or a smooth-running monofilament line generally are preferred for spin casting. The line whips from the fixed reel spool in spirals, making a backlash impossible. A pickup finger is then engaged and the line is wound back on the reel during the retrieve. ★ ★ ★

Hand Signals Made More Visible With Reflective Tape on Glove



A strip of reflective cellulose tape, fastened to the back and palm of the left-hand glove, will aid in making a motorist's hand signals more visible. Even with electric-turn indicators, it is advisable to use hand signals as an added safety measure.

H. L. Armitage, Calgary, Can.

Barrier in Private Driveway Keeps Trespassers Out

To prevent the nuisance of having a number of strange cars pulling into his driveway to turn around, one homeowner set up a barrier across the entrance. The barrier was made by cutting a number of 2-ft. lengths of old garden hose and setting them upright in a trench dug across the drive and filled with concrete. To a motorist driving by, these pieces of hose resemble sections of pipe and discourage him from entering the drive, while the homeowner may drive over them without damaging his car. For easy removal the hose also could be fitted in lengths of pipe anchored in concrete. — Bruce C. Vaughan, Jr., Springdale, Ark.



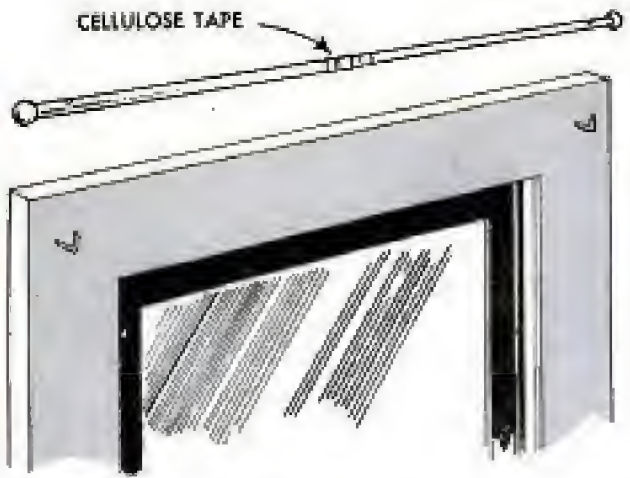
Blackboard chalk can be used to repair holes in plaster walls. Sharpened point of the chalk is pressed into the hole, and chalk is cut off flush with the wall. Patch is sanded and given a coat of shellac to seal surface before it is painted or papered.

Solving Home Problems

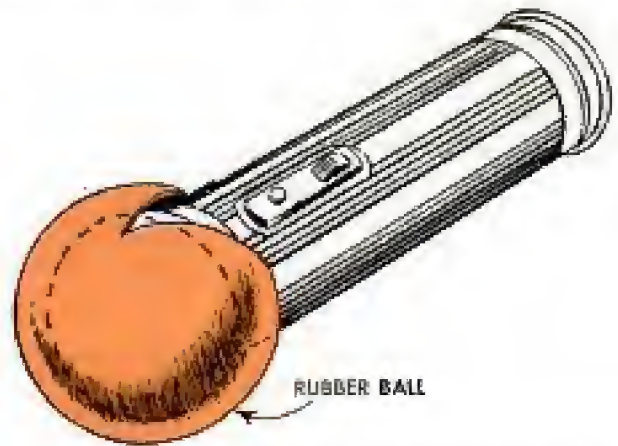


AT CANNING TIME or whenever you must use a paring knife steadily, a pad on the back of the knife will prevent a blister or sore finger. The pad is thick-wall rubber tubing, slit and slipped over the blade.

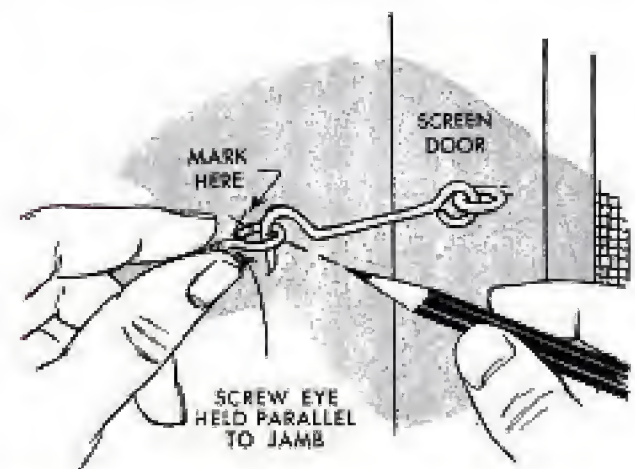
PAINT FROM A SMALL CAN is easier to use if the can is put into a discarded coffee cup. The handle of the cup makes it easy to hold and any drippings which run down the side of the can will be caught.



TO KEEP TELESCOPING CURTAIN RODS at their proper length when they are taken down for cleaning, wrap the joints of the rods with cellulose tape. Then, when they are replaced, the rods will slip easily in position.



THE LENS OF A FLASHLIGHT carried in a fishing-tackle box can be protected from scratching or breaking by means of a cover slipped over it. The cover is made by cutting a wedge from a child's hollow rubber ball, as shown, so that the opening is just wide enough to fit snugly over the end of the flashlight.



LOCATING A SCREW EYE for a screen-door hook is easy if you follow the marking method shown. After the hook is in place, slip the eye over it. Swing the hook against the jamb and hold the threaded portion of the eye parallel to the jamb. Then simply mark the jamb at the point where screw eye touches it.



OLD FRUIT-JAR RINGS placed over plants when they first appear above ground will serve as markers to indicate those needing special attention

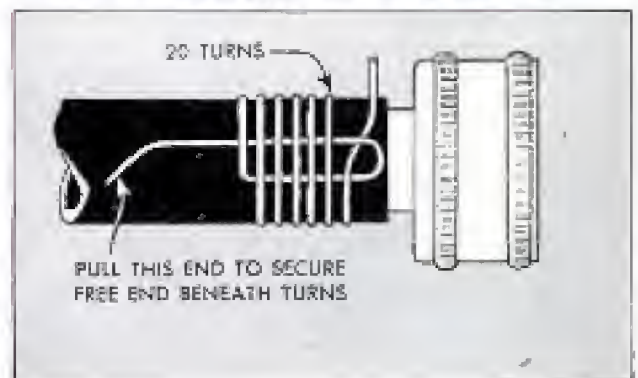
PAINTING A BASEMENT FLOOR is much less work if paint is applied with a paint roller fastened to a mop handle. With this method, the job can be done from standing position in half the usual time



CHILDREN'S BOOTS AND GALOSHES can be kept together and readily identified at home and at school if clipped together with a spring-type clothespin on which the name or initials have been painted in a bright color. Clips also can be used with mittens



WHEN YOU CAN'T OBTAIN a replacement for a damaged plastic-hose connector, the clamp-on type made for rubber hose can be used. Buy one that fits snugly into the plastic hose and discard the clamp. Warm the plastic until it softens slightly, then insert the new connector and bind it in place with a strong fishing-line, using the fishing-rod whip shown above



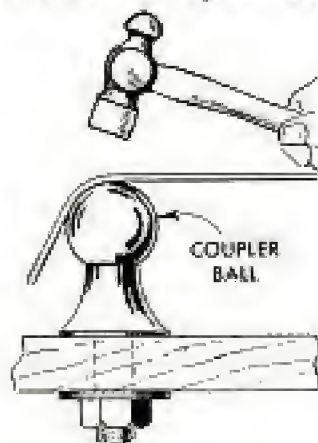
Rocks to Anchor Picnic Cloth Placed in Corner Pockets



You won't have to worry about the wind disturbing a picnic cloth if you sew a pocket in each corner of the cloth to hold a fair-size rock. Then, when ready to spread out the picnic cloth, all you have to do is slip a rock in each of the pockets. This idea also might be used in cloths used on outdoor tables. If you use a cloth somewhat larger than the table top, the stones in the pockets will hang down over the edges of the table, holding the cloth firmly in place.

Blanche Campbell, Las Vegas, Nev.

Trailer Coupler Serves as Anvil



When it is necessary to bend sheet metal or wire to a small radius, a trailer-hitch coupler will serve as a convenient anvil. The threaded bolt of the ball is inserted through a hole in the workbench and secured with a washer and nut. If portability is desired, so that

the anvil can be used on the job, it is mounted on a short length of heavy board and carried in the tool box. In use it is placed on two supports or sawhorses.

William B. Eagan, Louisville, Ky.

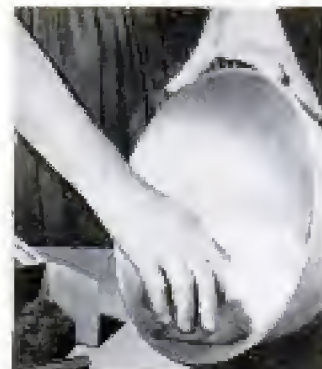
Test Paint Colors With Blotter

Paint generally dries to a somewhat lighter color than it appears in the can. When mixing colors, especially water-mix paints, test the color by painting a small

patch on a blotter. The blotter will absorb the liquid from the paint and the sample will dry in a matter of minutes, allowing you to see the exact hue the mixture will be when dry.—Tom Griberg, Moline, Ill.

Renewing Photoflood Reflectors

When a photoflood reflector becomes dull and smudged, rub the inside surface with steel wool to restore its original bright finish. Use a medium-grade wool and polish evenly over the entire surface.



Iron Separates Postage Stamps

Unused postage stamps that have stuck together should not be soaked apart, as this spoils the mucilage. Instead, lay a thin paper over them and run a moderately hot iron over the paper. They will come apart easily and the mucilage can still be used.

Mrs. Les B. Schultz, Cicero, Ill.

Rubber Tubing on Wrench Handle Prevents Bruised Fingers

Protection for the fingers when unlocking an adjustable, clamp-type wrench, may be provided by a short length of rubber tubing. This is fitted to the inside surface of the locking handle. If the tubing will not stay in place, it can be slipped over the handle to provide the same protection against skinned and bruised fingers.



☞ To make it easier to saw designs out of plywood and prevent it from chipping at the edges, coat the work with white shellac.

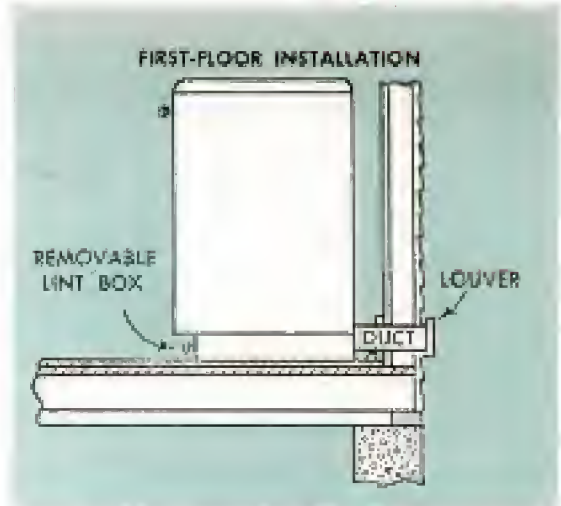
Vent Your Clothes Drier

BESIDES POSSIBLY DAMAGING woodwork and walls, the moisture-laden air from a clothes drier will cause uncomfortably high humidity in hot weather and in cold weather will "steam" the windows. Venting the exhausted air to the outside of the house will overcome this problem. As most modern driers have provisions for outside venting, it is necessary only to connect regular furnace ducting of a suitable size and shape to the drier outlet and run it to the outside.

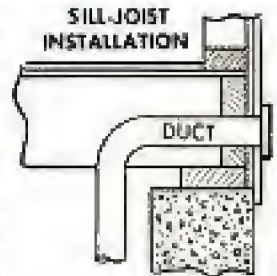
Some driers exhaust through a lint box at the front of the drier at floor level. A conversion kit to change the outlet to the rear is available at your appliance dealer. The kit contains a new lint box that seals the front opening, and a rear duct fitting that replaces a cover plate on the back of the drier. The fitting will receive standard 3 1/4 x 10-in. rectangular ducting. Driers which already exhaust at the rear need only be fitted with ducting.

Methods for venting driers installed on the first floor or basement are detailed at the right. The first-floor vent goes directly through the wall, while the basement installation requires that the ducting pass through the sill joist or a window. A piece of hardboard or sheet metal replaces the glass in the window and provides an opening of the proper-size. A rustproof louver should be fitted on the weather end of the vent. If possible, the duct should not be longer than 10 ft., as a longer run of ducting will require the installation of a booster fan to assure proper exhausting of the humid air. If the vented moisture stains the siding above the louver, it may be necessary to extend the duct, or fit it with a cowl. Also, a side shield may be necessary if a prevailing wind causes similar trouble.

Tom Riley, Portland, Ore.



Details show three methods of venting clothes driers, one for first-floor installation, two for basement. Regular metal furnace ducting and elbows are used to exhaust the moisture to outside





SHUFFLEBOARD FOR YOUR BASEMENT

By Clifford B. Hicks



Asphalt tile can be cut by scoring on both sides with an awl, then snapping sharply

SHUFFLEBOARD, the game that long has challenged the ocean traveler and summer-resort visitor, now is becoming a great favorite in the home. Thanks to modern tile inserts and scaled-down playing equipment, shuffleboard has moved into home basements and recreation rooms.

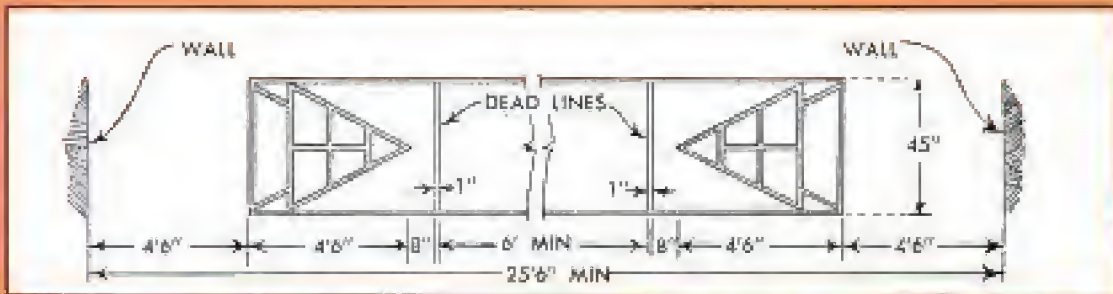
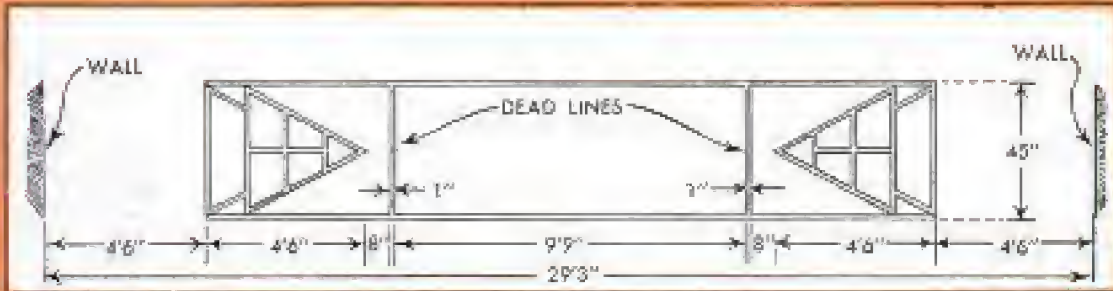
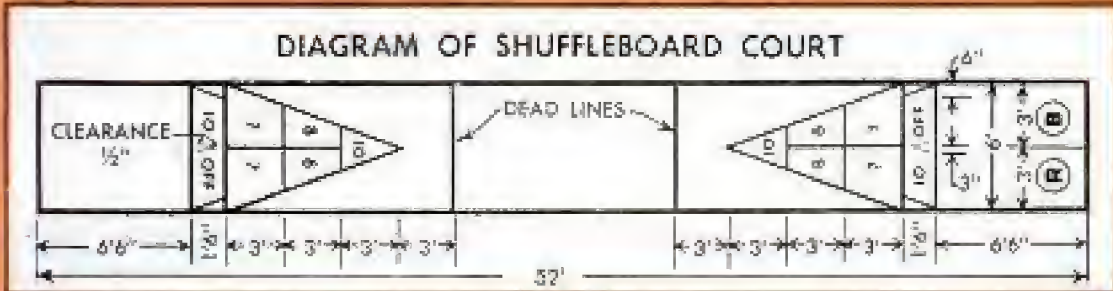
The object of the game is to slide disks from one end of the court to the scoring area at the other end. Half the fun of the game is banging your opponent's disk off a scoring area. Until recently the game made few appearances in home recreation rooms because the regulation court is 52 ft. long—too long for most basements. Now along comes the smaller tile court and the new shuffleboard equipment, only $\frac{3}{4}$ regulation size. The disks, for example, are only 4 in. in dia. instead of 6 in. This makes it possible to scale down the entire court without scaling down any of the fun. The recommended length of the scaled-down court is 29 ft. 3 in., (center diagram, opposite page), but it can be made as short as 25 ft. 6 in. by decreasing the area between the "dead lines." The regulation court is shown in the top diagram. Tile inserts for this full-size court are available on order through your local floor-tile dealer.

The shuffleboard set consists of four aluminum cues and eight disks. Your flooring dealer can tell you where to buy the set or he can order one for you.

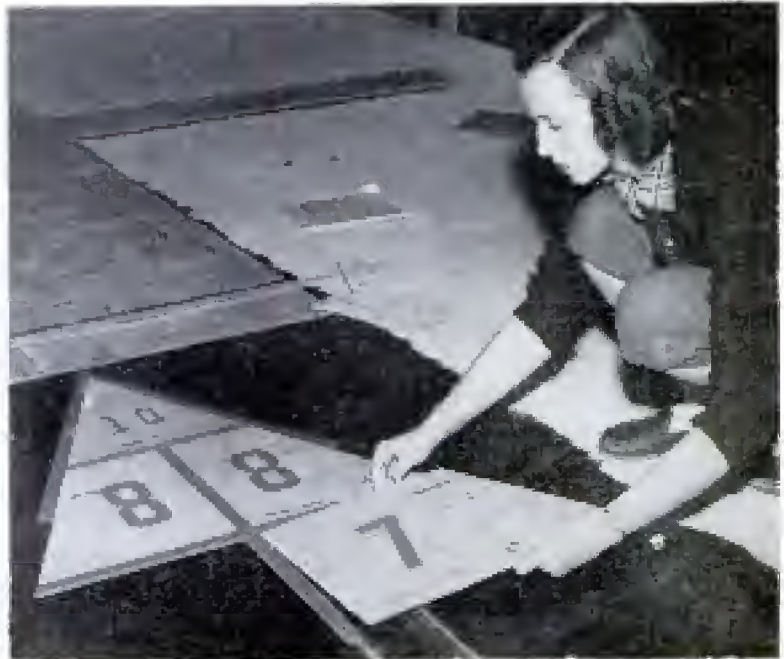
The inlays for the scoring areas are available in kit form. Each kit contains two scoring areas, or one complete court. The only cutting required is the trimming of the field tile immediately adjoining the scoring diagram. In the case of asphalt tile, this is done easily by scoring the tile with an awl on both sides and then snapping it on the scored line. Vinyl tile is simply cut with a sharp knife. For ease of installation, the scoring inserts are made to fit exactly into an area covered by six 9-in. tiles in one direction and five 9-in. tiles in the other.

Starting in the center of the area chosen for the court, lay the tile to the points of the scoring areas. Because these points lie exactly at the midpoint of a 9-in. tile, snap a chalk line from these points to the end of the court to represent the lines down the middle of the scoring inserts. Lay both inserts next, and then fill in the rest of the tile around the court.

For further information on how to lay a tile floor, see page 175 of the November 1951 issue of *Popular Mechanics*. ★ ★ ★



The top diagram above shows the dimensions for a regulation shuffleboard court. The middle diagram gives the measurements of the scaled-down court, on which equipment that is $\frac{2}{3}$ of regulation size is used. Bottom diagram shows the minimum dimensions that can be used when laying out a shuffleboard court

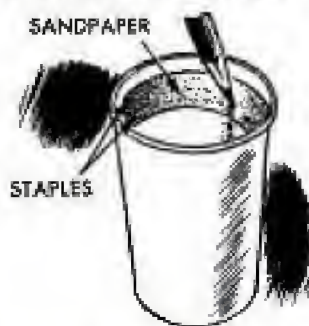


Dowels in Multiple Bench Stop Hold Irregular Shapes



Adjustable to fit a variety of shapes, the multiple bench stop shown in the illustration consists of a piece of plywood drilled to receive $\frac{1}{2}$ -in. wooden dowels. These are cut into 3-in. lengths and the holes are drilled to provide a snug fit. The plywood may be clamped to the workbench or held with dowels fitted in holes drilled in the bench top.—Walter L. White, Chicago.

Sandpaper Inside Paper Cup Provides Pointer for Pencil



Draftsmen and artists who use a sandpaper block to keep pencil points sharp will find that an ordinary paper cup can be used to eliminate the mess caused by using this method. Staple a strip of fine sandpaper inside the upper edge of the cup. When the pencil is sharpened the wood and graphite dust will fall inside. The cup can be discarded when the sandpaper wears out.

Removing Rust From Files

A little muriatic acid, applied full strength with a small brush, will be found effective for cleaning a badly rusted file. After a few minutes, rinse away the acid with running water. If some traces of rust still re-

main, a second application will be necessary. When no more rust remains, use a soda-and-water solution to neutralize whatever acid is left on the file, rinse thoroughly and dry. Then apply a coating of thin oil. Clinton R. Hull, Costa Mesa, Calif.

Eraser-Stick Brushes Utilized On Home-Workshop Jobs

When eraser sticks, which are used in most offices, are discarded, the brush on the end usually is still in good condition and can be used in countless ways around the home workshop. It is ideal for applying shellac to gaskets and compound to pipe joints. The brush also can be used to scrub gasoline into hard-to-reach places for a thorough cleaning job when overhauling motors and other machinery.



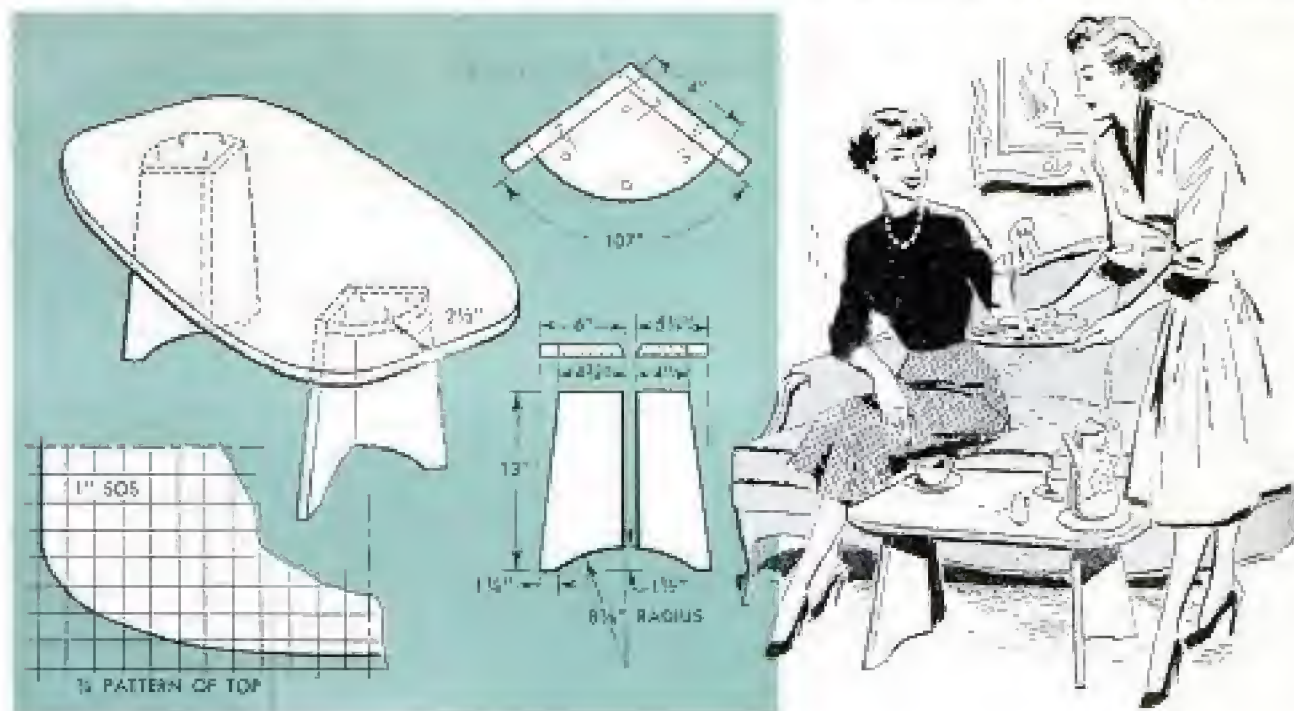
Jos. J. Frisch, Cincinnati, Ohio.

Furniture Polish Is Easily Applied With Window-Spray Attachment

Polish may be applied to furniture in a thin, uniform coat with a spray attachment, such as used for window-cleaning preparations. Since the bottle is always capped when the attachment is in place, there is no chance of spilling the polish. If the attachment does not fit the bottle in which the polish is contained, the liquid may be transferred to a container that will accept the sprayer.



Simple Coffee Table Is a One-Evening Project

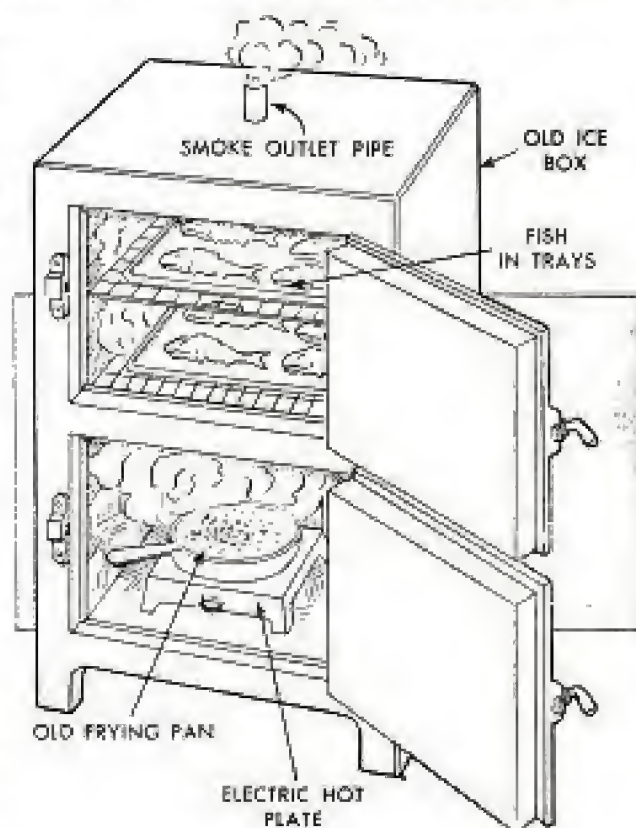


The original of this coffee table was made of hardwood salvaged from an old bed and a radio cabinet. However, it can be made from 3/8-in. plywood or, for an exceptionally fine job, solid-stock walnut or mahogany can be used. The construction is simple and the detail above gives all information. If you want a stain and scratchproof finish, apply a decorative laminate to the top of table.—Elmer W. Ferris, Winnetka, Ill.

Fisherman's Personal "Smokehouse" Utilizes Wooden Icebox

Utilizing an old-fashioned wooden icebox, this "smokehouse" permits a fisherman who does not have access to a smokehouse to cure his own catch. The smoke is generated by setting a cast-iron frying pan, filled with maple chips, on an electric hot plate which is placed in the bottom of the icebox. The fish are placed on metal trays on the shelves in the upper section of the box. With both doors closed, a length of 1-in. pipe, set in a hole cut in the top of the box, allows the excess smoke to seep out. Individual tastes will vary, but in the original smokehouse, two hours was sufficient for a good smoking.

Thomas P. Ramirez, Fond du Lac, Wis.



Replace Sink-Drain Cleanout Plug With Open-End Brass Gate Valve

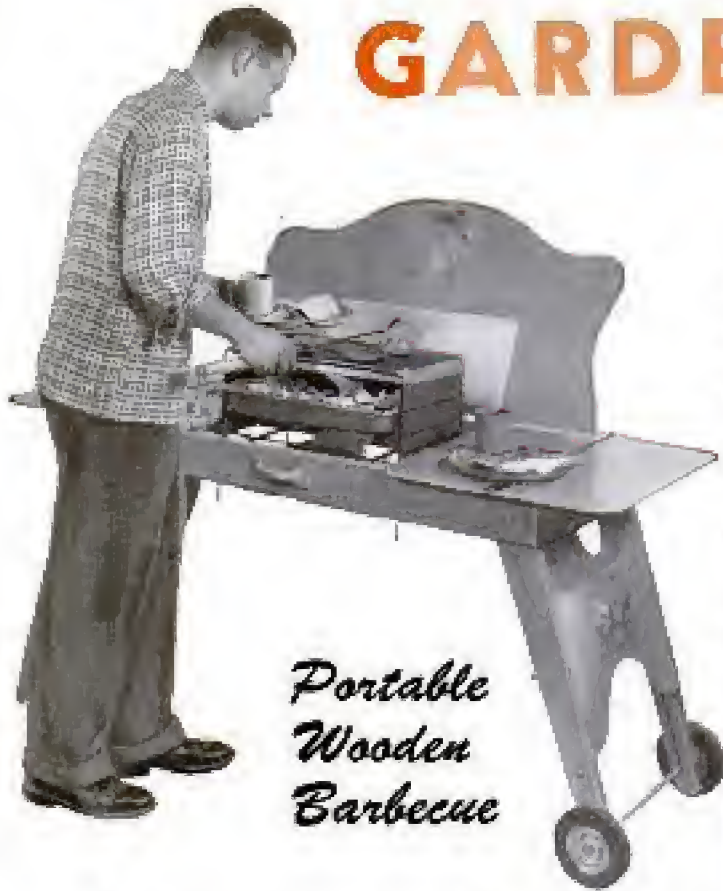
Because the cleanout plug for the kitchen sink is opened only when the sink is stopped up, it often rusts and becomes very difficult to open. This can be avoided if the cleanout plug is removed and replaced with an ordinary open-end brass gate valve. With this in place, all you have to do to clean out the drain is to open the gate valve and insert the wire or snake.

Art Frank Williams, Wood-Ridge, N. J.

☐ An old jar rubber, glued to the bottom of a dog's food dish, will help prevent it from sliding about while the dog is eating.

GARDEN DINING

Made Easy

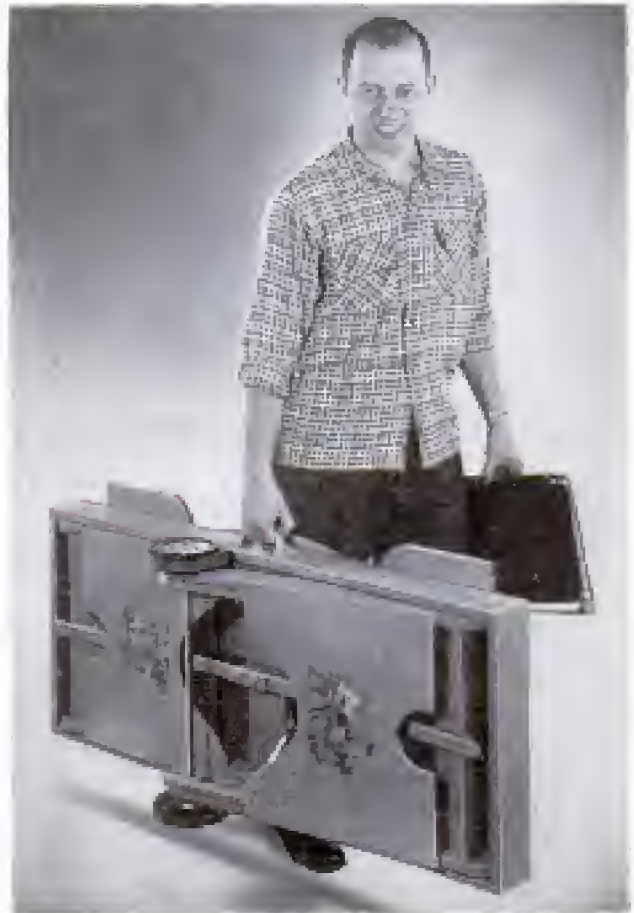


*Portable
Wooden
Barbecue*

THE PORTABLE BARBECUE pictured in use above is made of common lumber and hardboard. It handles most any popular charcoal grill or a small gasoline stove, and it folds conveniently for carrying as in the photo at the right. Note in the construction details of this barbecue how the upper portions of the legs are rounded so that the notches formed on the edges of the legs serve as stops when they engage the edges of the end aprons. A locking



*Lawn
Chair*



Portable wooden barbecue is fitted with convenient carrying handle and folded legs are held in place with friction catch. Leaves and windbreak fold flat

stretcher holds the legs in the open position and a cabinet-type friction catch holds the legs in the folded position. A catch on one leg is all that is necessary and its location should be determined with the legs folded. Note that the legs are fitted with extensions to permit leveling the barbecue as well as raising it to the desired height. On the leg unit which is fitted with the wheels, the extensions are slotted to slip over the axle and down beyond the wheels.

The aluminum barbecue also is a folding unit, but differs from the wooden unit in

Portable Aluminum Barbecue

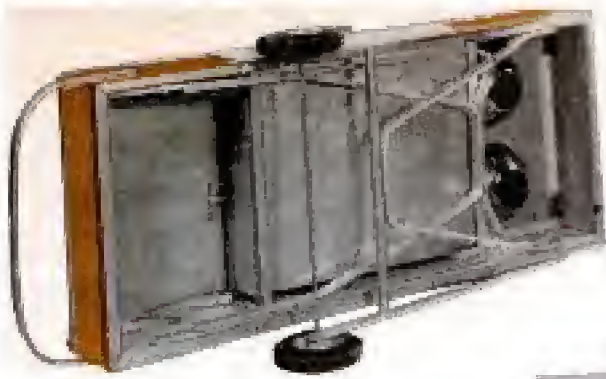
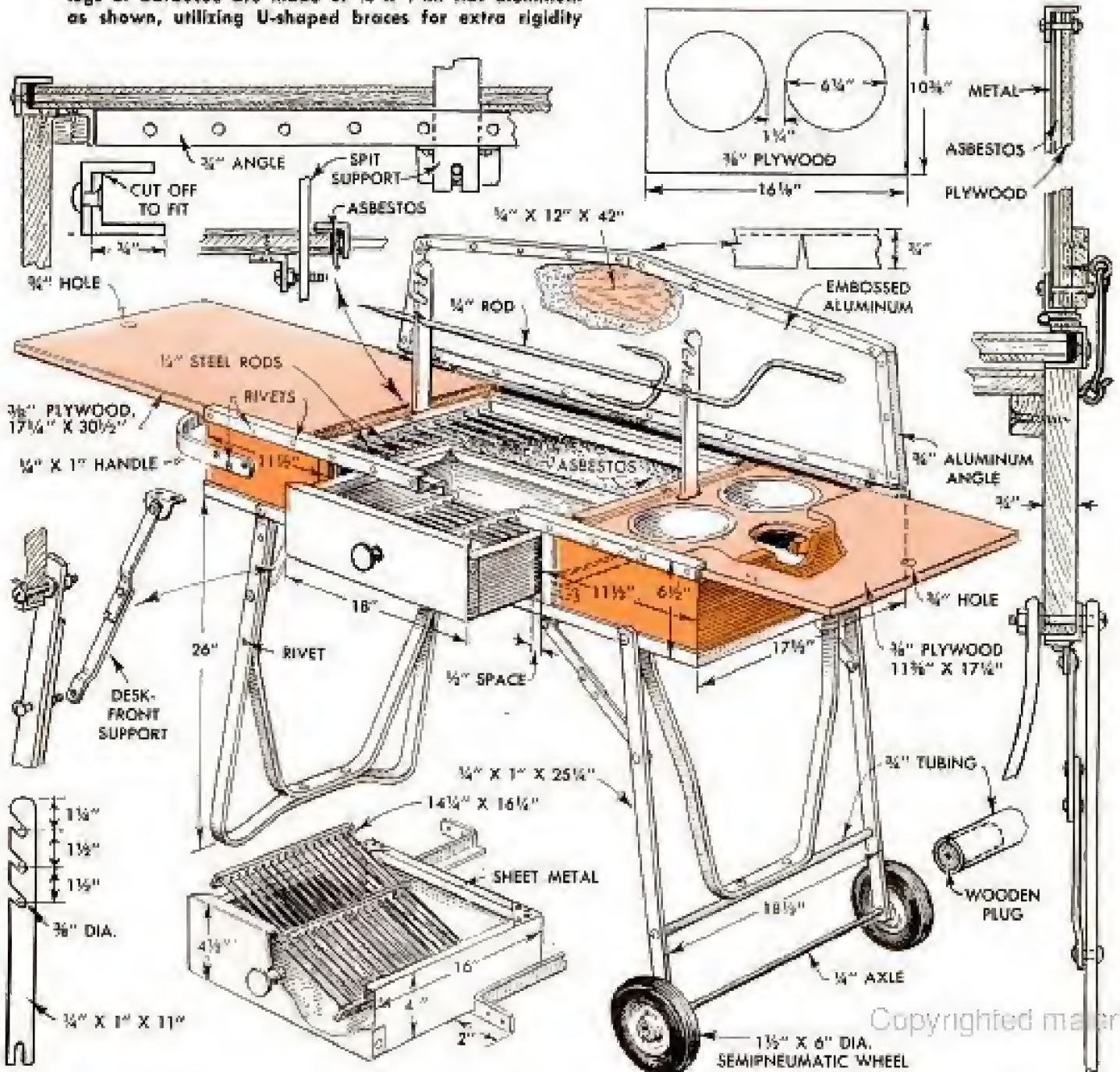


Photo of barbecue, above, shows how the legs appear in the folded position. When the barbecue is set up, ordinary desk-front supports lock legs in place

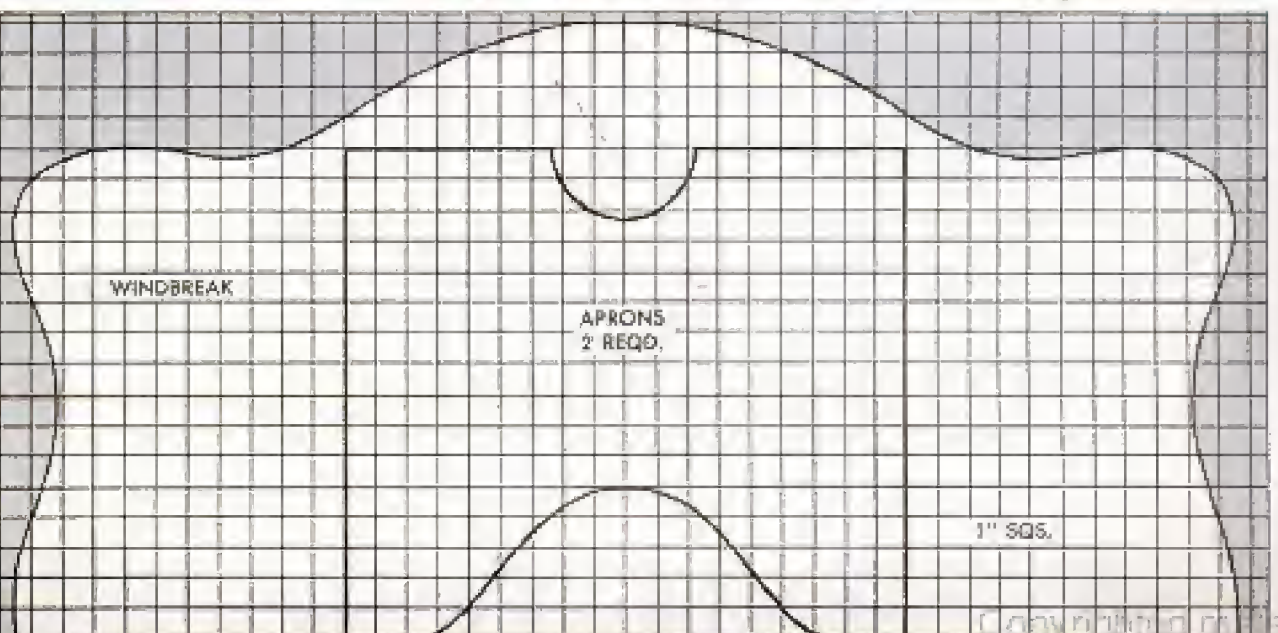
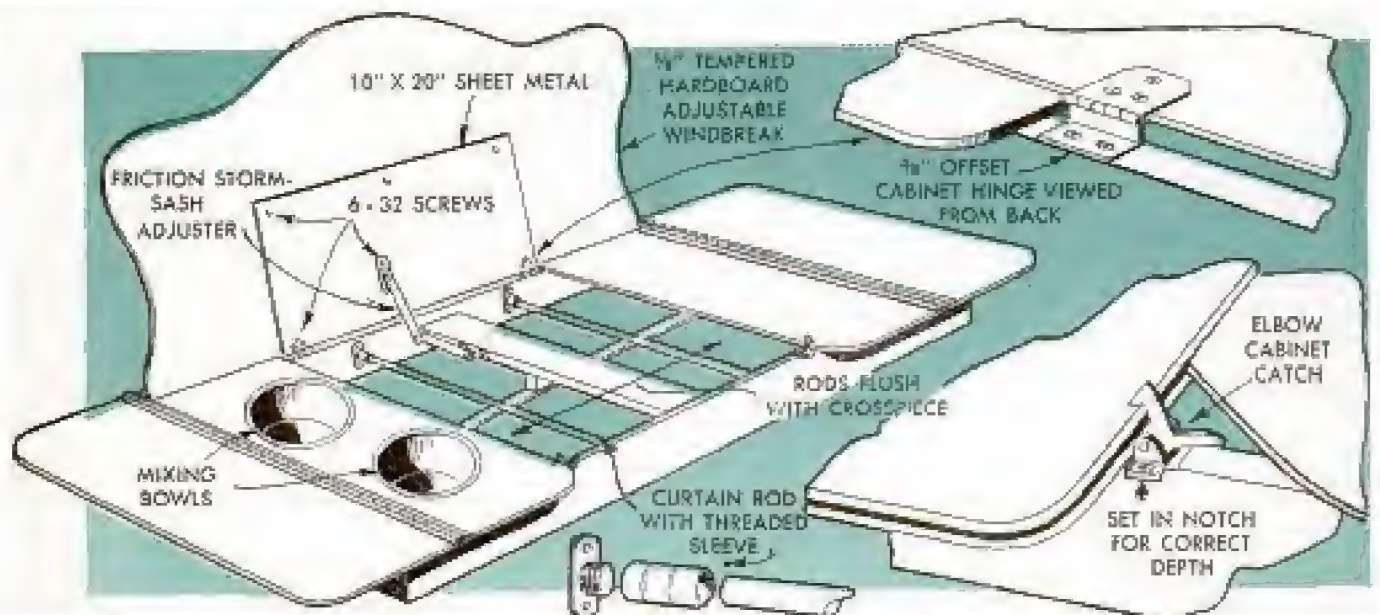


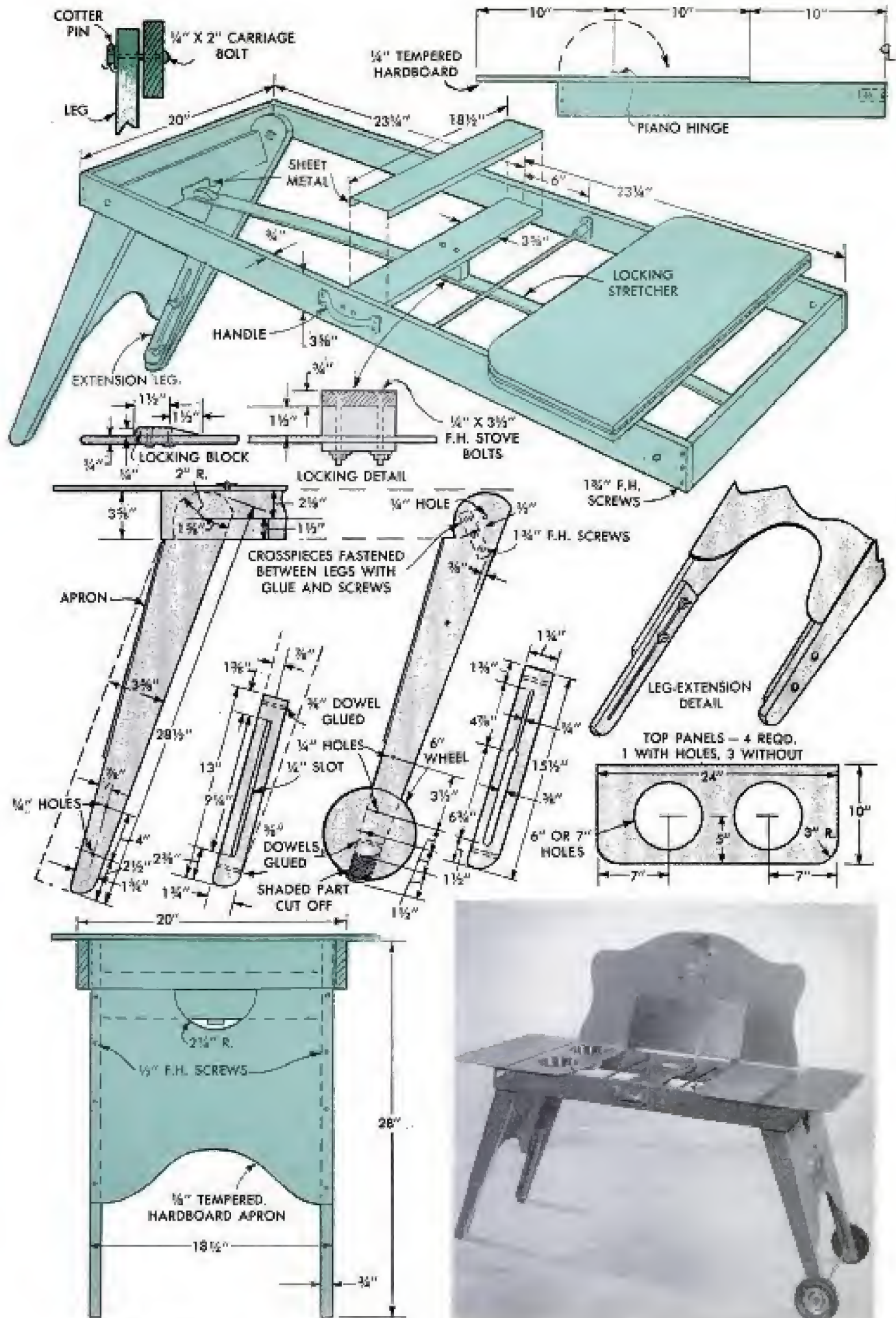
Construction of aluminum barbecue is started by making a wooden apron of 1 x 6-in. stock, mitering the corners of the apron. Then 3/8-in.-plywood top pieces are fitted to apron, leaving space between them for the grill. Bottom of apron is trimmed with aluminum angle and front and back top edges are fitted with channels to take the sliding leaves. Note that each channel is made of two lengths of angle which are riveted together after the first length has been screwed to edge of apron. The legs of barbecue are made of 1/4 x 1-in. flat aluminum as shown, utilizing U-shaped braces for extra rigidity





Photos above show the steps in folding the portable wooden barbecue. First, windbreak is folded down and leaves are folded over windbreak, elbow cabinet catches holding them in place. Then the legs are folded, as above, with barbecue resting on its side





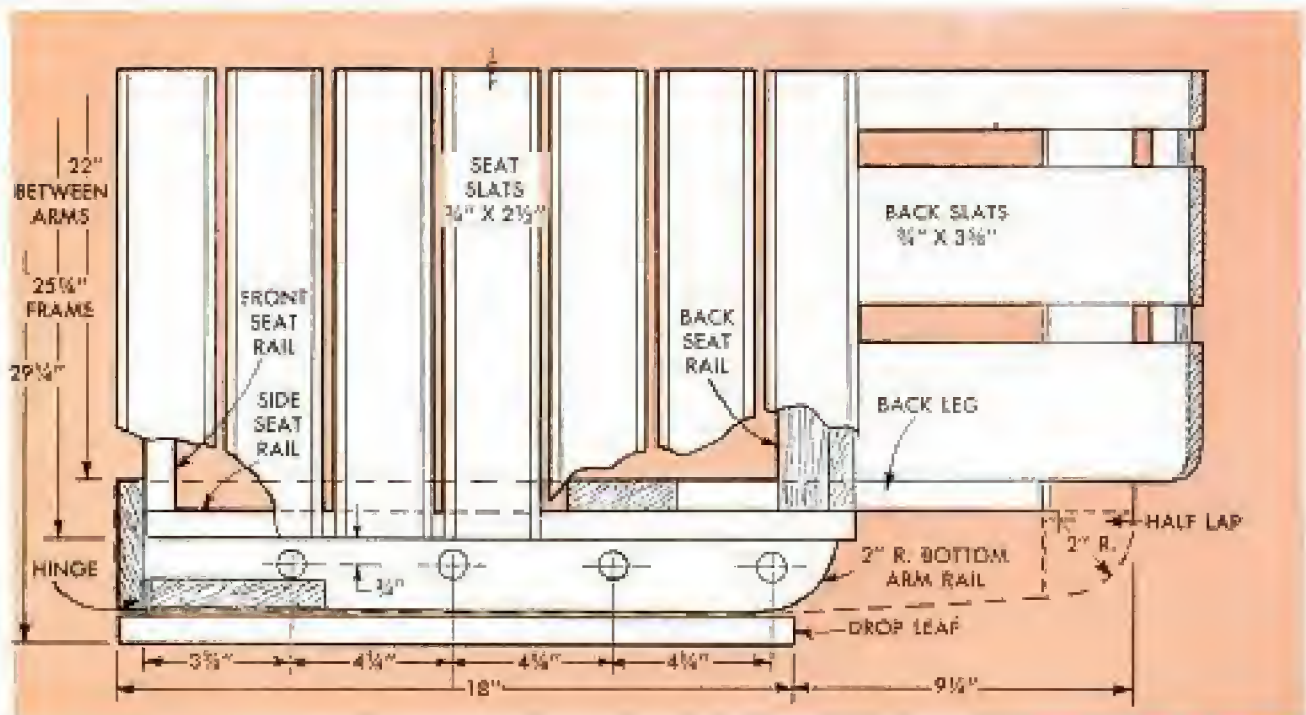


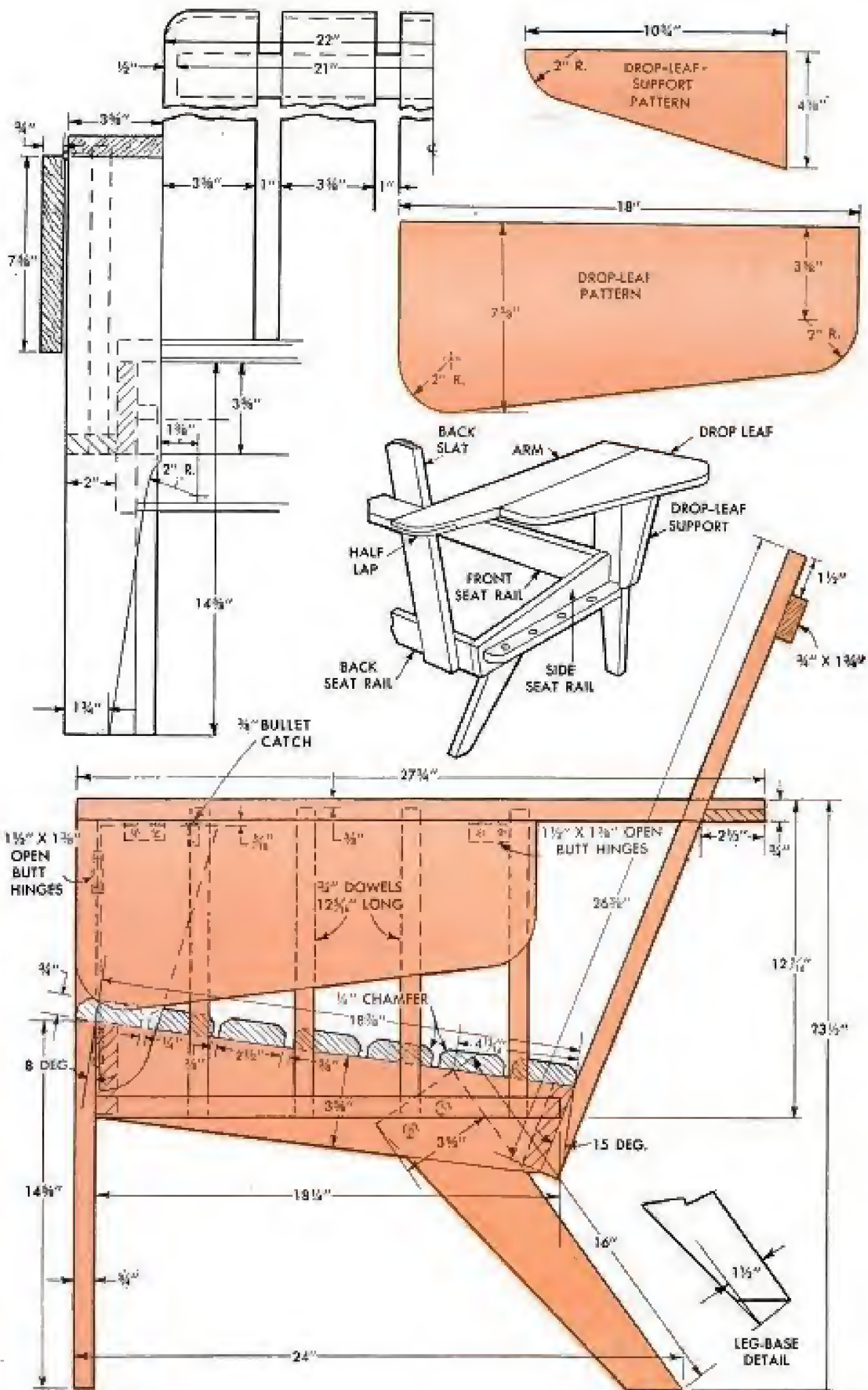
Front and rear views of lawn chair, above and below, show convenient drop-leaf arms in raised position. Crossrail between arms supports back slats



that it has a self-contained charcoal burner. The latter is a sheet-steel drawer which contains a bottom grid of steel rod and flat stock as detailed. The grill also is of steel rod. The rest of the metal parts—legs, top framing, windbreak framing, channel for the sliding leaves, and the spit—are made of Do-It-Yourself Aluminum. Either 8 or 10-in. desk-front supports are used to hold the folding legs in the open position. The wooden table apron is of 1 x 6-in. stock, while the table top pieces and sliding leaves are of $\frac{3}{8}$ -in. plywood. The apron in back of the fire drawer as well as the edges of the drawer cutout and the edges of the top pieces on which the grill rests are lined with asbestos to prevent charring from the heat of the charcoal fire. Asbestos sheet is also sandwiched between the plywood backing and the aluminum front of the windbreak.

The comfortable lawn chair detailed on these two pages features drop-leaf arms that provide "table" space for refreshments, food or ash trays. The chair is built of $\frac{3}{4}$ -in. stock (1-in. lumber) as in the details. Note that the side seat rails are mounted at an angle of 8 deg. to the front rail. The back rail is installed at an angle of 15 deg. to the side rails to give the proper tilt to the chair back. The chair arms are fitted with rungs of $\frac{3}{4}$ -in. dowel. The lower ends of the dowels are glued in holes drilled in the bottom arm rails, while the upper ends are glued in blind holes in the top arm rails. Each drop leaf is hinged to the top arm rail and is held in the raised position by a drop-leaf support. The latter is hinged to swing under the top arm so the drop leaf can fold flat. ★ ★ ★





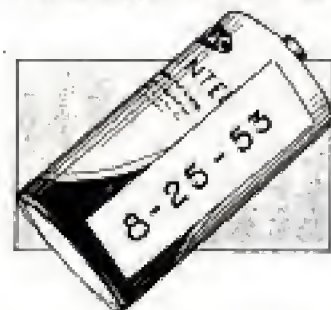
Length of Rope Provides Clamp For Holding Irregular Shapes



If you have experienced difficulty holding an irregularly shaped piece of work in a wood vise, this simple rope clamp will be a welcome tool. In use, a $\frac{1}{4}$ -in. rope is passed through two holes drilled in the bench top near the front and rear edges. The rear end is knotted and the end at the front is run through a clamp on the bench apron. The clamp consists of one block nailed to the apron and another block, which slides on a nail guide and is held with a bolt and wing nut.

Walter L. White, Chicago.

Flashlight Batteries Dated



When replacing batteries in a flashlight or photo flashgun, write the date of insertion on a piece of adhesive tape and stick it to the sides of the batteries. This date will serve as a reminder that

the batteries must be replaced at regular intervals and warn you when the batteries are becoming overage.

Eugene Lee Burner, Morgantown, W. Va.

Homemade Ferrotyp Plate

A smoothly lacquered sheet of tempered hardboard makes an excellent substitute for a metal ferrotyp plate, and one that does not require waxing to prevent stick-

ing. In use, the board is sponged off in the normal way, then the prints are applied and squeegeed to the plate with a roller and left to dry.

Andrew Brennan, Philadelphia, Pa.

Improvised Self-Opening Pliers

When an assembly job requires the use of self-opening pliers, the home craftsman may convert a pair of utility pliers for this purpose by using a large safety pin or length of clock spring. Cut off the head and sharp point of the pin, spread it to the required span and tape it to the inside surfaces of the plier handles. If a piece of clock spring is used, bend it U-shaped and tape it in the same manner.



Bright Light and Pane of Glass Permit Tracing Picture

Set vertically in two notched blocks, a pane of glass will permit anyone to trace accurately a photograph or drawing. The picture to be copied is thumbtacked to a horizontal surface and the glass is set alongside. A strong light then is placed so that the picture is reflected vividly on the glass. Next, a sheet of paper is tacked to the surface on the opposite side of the glass. It now is possible to look through the glass and trace the reflection on the paper. The reflection and copy will, of course, be reversed.



☐ The bottom half of a milk carton makes a good "pot" for starting house or garden plants. When ready to transplant, merely cut away the paper box. Soil stays intact around the tender roots.

WTH 56

Make Your Own

Book for Boys

Water Skis

By Don Skillman

THE CONSTANTLY increasing number of motorboat owners have brought about an equal rise of interest in water sports, among which water skiing is one of the most thrilling. Any craftsman can make his own water skis at less cost than buying them, and will have the added pleasure of building his own equipment.

Spruce is the first choice of wood for the skis, followed by ash, Port Orford cedar and yellow cedar. Whatever wood is used, be sure it is vertical-grained so it will take a smooth bend. If you do not have a jointer, have the lumberyard surface and joint the lumber to a finished dimension of $\frac{5}{8}$ x 6 in. and square off both ends. The length of the skis is determined by the weight of the skier and the horsepower of the motorboat used. The table at the end of this article (page 179) provides that information. While at the lumberyard get four lengths of $\frac{5}{8}$ x $\frac{5}{8}$ x 18-in. white oak to be used as the rudders. If oak is not obtainable, the same kind of wood as used for the skis may be used for the rudders. An alternate material for the rudders, depending on personal preference, is 1 x 1-in. aluminum T-bar. The rudders also can be purchased ready-made in some sports stores.

Bending the ski blanks is the first and most difficult step in making the skis, and requires building a bending jig. The jig is built from two 1 x 6s about 6 ft. long. One

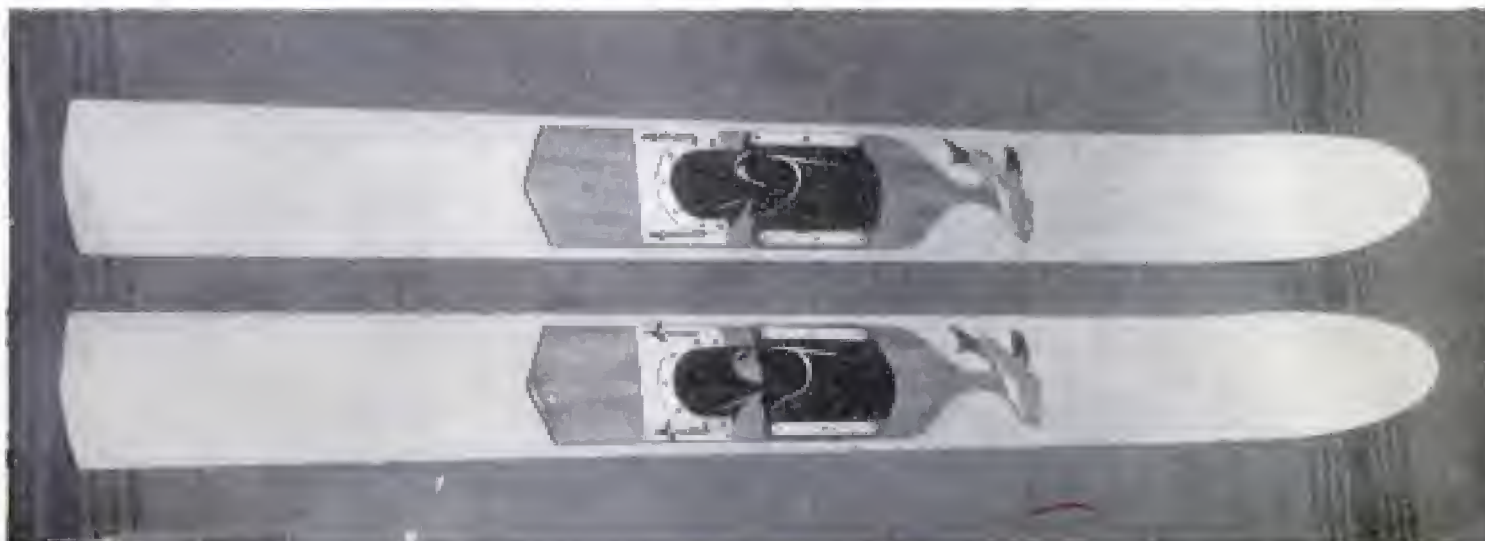


As you rush along in the wake of a couple of husky outboards, water skis give wings to your flying feet

end of each board is cut to form the desired radius—20 in. for 5 ft. or less, and 22 in. for 6-ft. skis—and the two 1 x 6s are then joined by cross cleats 14 in. long. The curved section of the jig is either planked solidly with narrow strips, as shown in the detail, or covered with a piece of hardboard to provide a smooth surface.

After the jig is built, the ski blanks must be steamed so they can be bent. The easiest way for the home craftsman to do this is to set up a 55-gal. oil drum on bricks in the back yard, fill it with water to a depth of 18 in. and build a wood fire under it. The ski blanks are placed in the boiling water and steamed for at least an hour. If the

The "islands" under the foot bindings of these finished skis are shapes cut from thin stock stained dark





The rounded front of the skis is cut with a coping saw after 6-in. radius has been marked from pattern

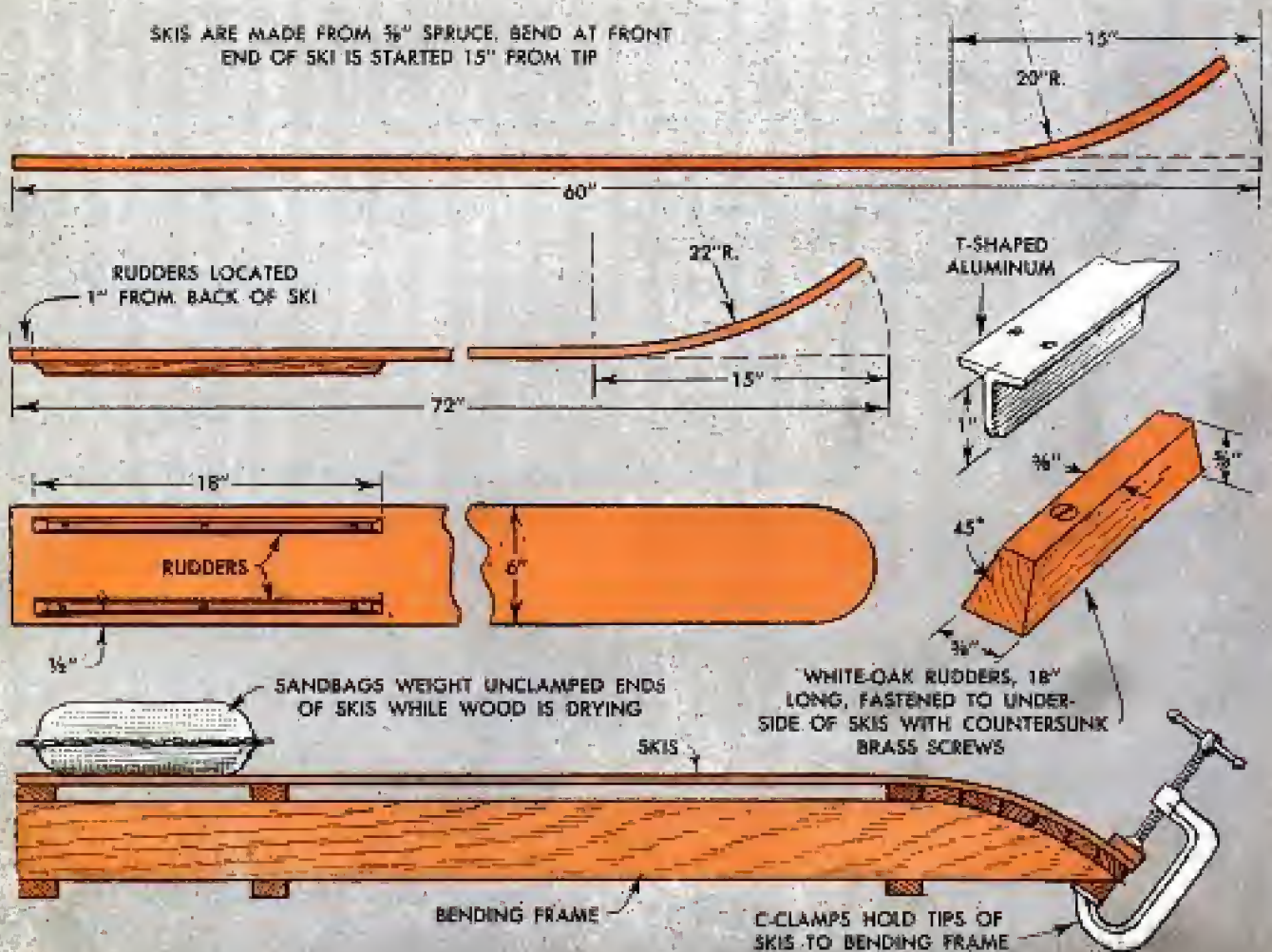


After cutting the rounded front end of the skis, carefully sandpaper away all roughness and sharp edges

wood is not sufficiently pliable at the end of that time, add more water and boil the blanks longer. When the blanks have been thoroughly steamed, remove them from the water and, holding them side by side, quickly clamp the steamed end over the curved end of the bending jig. Press the opposite ends of the blanks down and hold them with clamps or sandbags. Make sure the straight portion of the skis are parallel to the jig. Use shims and weights or clamps

to correct any undesired bends. After the blanks are clamped into place, allow plenty of time to dry and set. One week is the minimum, two weeks are better.

When the blanks are thoroughly dry and set, the next step is to round the front end of each ski. Make a paper pattern, using a 6-in. radius, and then trace the curve on the skis. Cut the curve with a coping, jig or bandsaw. Now, sand all surfaces and apply three coats of spar varnish, allowing



plenty of time for drying between each coat.

The next step is to install the rudders. If wooden rudders are used, they should be shaped to the dimensions given in the detail, sanded and varnished. Use three 1-in. No. 6 brass screws to attach each rudder. Holes must be drilled and countersunk in the aluminum rudders to permit installation. The rudders are located 1 in. from the rear end of the skis and $\frac{1}{2}$ in. from the edges of each ski.

Bindings for the feet are next. They also can be purchased ready-made from a sporting-goods store, but the craftsman can make them from sheet brass or aluminum which is easily cut and worked with wood-working tools. The rubber used is salvaged from truck inner tubes; the rubber is extremely tough and is $\frac{1}{8}$ in. thick. The half-patterns for the rubber sections of the heel and toe bindings are drawn on $\frac{1}{2}$ -in. squares, the paper folded and the completed pattern traced directly on the rubber. The slotted heel plate is drilled and tapped for 10-32 brass machine screws, which are used to hold down the U-shape piece which, in turn, holds the rubber of the heel binding. Wing nuts are used on the $\frac{1}{4}$ -in. screws which hold the heel plate to permit adjusting the bindings. The strips for holding the toe bindings are drilled and countersunk to receive brass wood screws.

When installing the bindings, balance

TABLE TO DETERMINE LENGTH OF SKIS

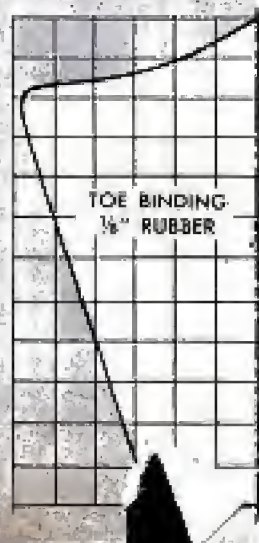
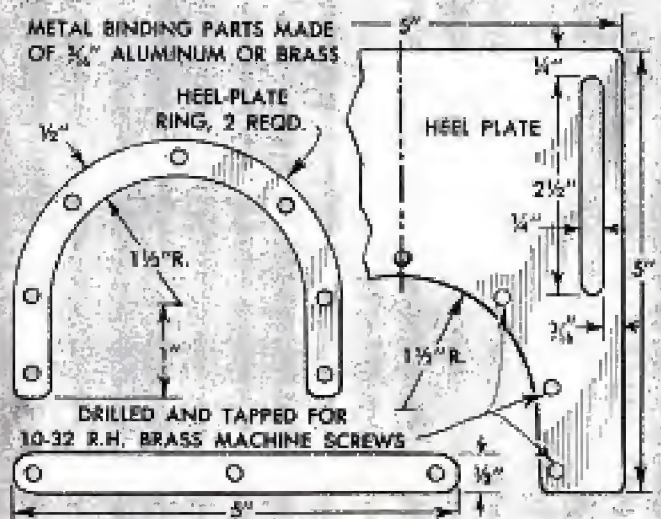
Weight of Skier	100-120	140	160	180	200	200 up
10 hp.	4½ ft.	5 ft.	5½ ft.	6 ft.	6 ft.	6 ft.
15 hp.	4½ ft.	4½ ft.	4½ ft.	5 ft.	5½ ft.	5½ ft.
15-30 hp.	4½ ft.	4½ ft.	4½ ft.	4½ ft.	5 ft.	5 ft.
Inboards	4½ ft.	4½ ft.	4½ ft.	4½ ft.	4½ ft.	4½ ft.

the skis on a thin edge to find the exact center of balance. Locate the bindings so the ball of the foot touches directly on this spot.

The "islands" under the foot bindings are simply ornamental wooden shapes cut from thin stock and stained or varnished a contrasting shade. Figures or designs may be carved or jigsawed and fastened to the islands, as shown in the picture of the completed skis, to give individuality to your skis. If you do use islands on your skis, find the center of balance after they are in place; it is important that the ball of the foot rests on this balance point so that the skis will ride properly in the water.

After the last coat of varnish is completely dry, all you need to try out the product of your labor is a body of fairly calm water and a friend with a motorboat. Use a good, strong tow rope; one can be purchased at a sporting-goods store. If you haven't been on water skis before, take it easy at the start. At 30 m.p.h., the surface of the water is a lot harder than it is when you are swimming. ★★★

METAL BINDING PARTS MADE OF $\frac{3}{16}$ " ALUMINUM OR BRASS



HALF PATTERNS



Each rudder is fastened 1 in. from back of ski and $\frac{1}{2}$ in. from edge. Three 1-in. No. 6 screws are used

The toe section of the completed foot bindings is fastened with wood screws, the heel with wing nuts





Negative Viewer Always at Hand When Installed in Desk Drawer

A desk drawer is an ideal spot for a viewer used in cropping photo negatives, or for tracing drawings. The viewer can be made by installing two lamp bulbs inside the drawer and topping them with a piece of translucent glass set flush with the drawer top. Cleats will support the glass and a porcelain receptacle and a Y-plug will take care of the bulbs, which should be centered under the glass. The glass should be slightly shorter than the length of the drawer to provide an opening for ventilation and for storage of the lamp cord. Two or three strips of tape will keep the glass in position.

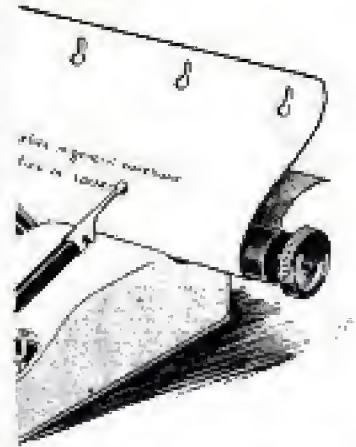
Airtight Seals for Solution Bottles Provided by Plastic Liners

Airproof seals for caps on bottles and jars containing photographic solutions can be made from vinyl-type upholstering material. Remove the original liners and replace them with disks cut from the plastic.



Pencil Clip Smooths Errors On Mimeograph Stencil

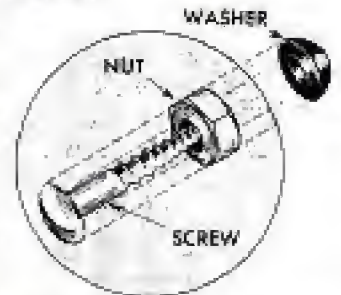
When correcting a mimeograph stencil, the errors must be smoothed over before the correction fluid is applied to prevent the fluid from flowing through. As the special burnisher for the purpose is not always at hand, the ball tip of a pencil clip may be used instead. For convenience, reverse the clip on the pencil, as shown in the drawing.



Small Leaks Repaired In Oil or Water Tanks

An emergency repair for small leaks in oil or water tanks can be improvised from a self-tapping screw, a nut and a rubber washer. Use a screw of a size that will fit the hole, slip a nut over the screw, then force a rubber washer over the end of the screw. The screw, pulling into the hole, will force the nut against the rubber washer, expanding it to seal the leak. If an oil tank is being repaired, apply a small amount of varnish or shellac to the rubber washer.

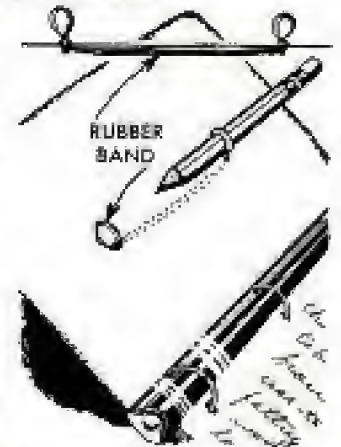
Mitchell Jaskiewicz, Chicago.



Rubber Band Through Cover Holds Pencil on Notebook

To keep a pencil at hand inside the cover of a notebook, insert a rubber band through two holes punched in the cover. Then knot the band near each end to provide loops for the pencil and also to keep the band in place. A small ruler, dividers and other equipment can be carried in the same way. A flat rubber band is preferable to a round one for this particular purpose.

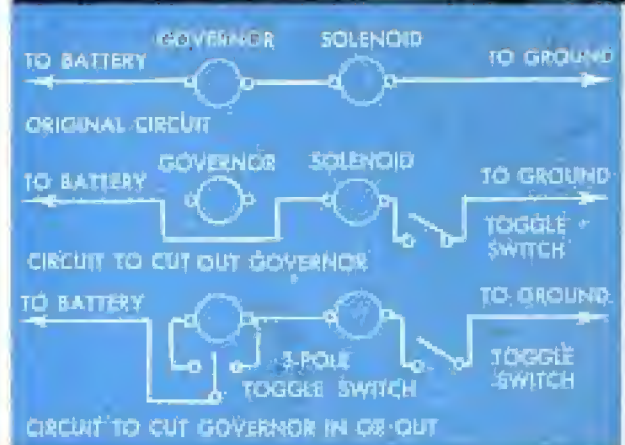
G. E. Hendrickson, Argyle, Wis.





Automatic Hill-Holder

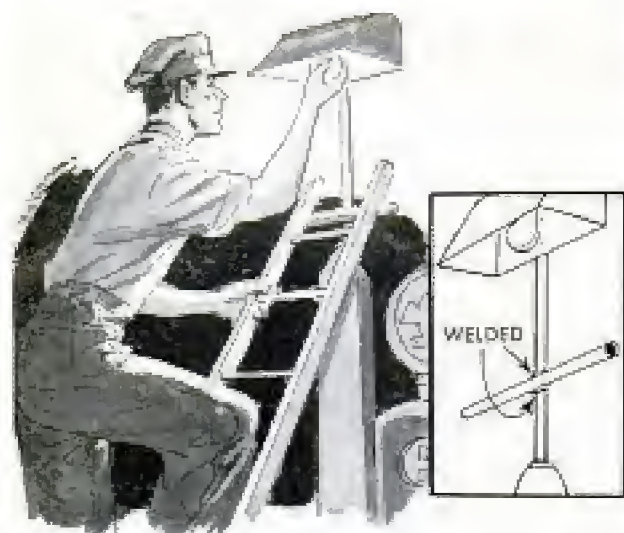
Six speeds forward, no-clutch shifting and an automatic hill-holder are all available if your car is equipped with a Borg-Warner overdrive unit. As shown in the middle circuit of the wiring diagram at the right, the overdrive governor is bypassed and a toggle switch, which is installed on the dash, is wired between the solenoid and the ground. When the switch is in the "on" position, you have overdrive range in all gears, engine-compression braking and the hill-holder. Downshift from overdrive range to conventional is done by simply pressing the accelerator all the way down. **Warning:** Most transmissions will not go into reverse when the switch is in the on or overdrive-range position. Flip the switch to "off" before shifting to reverse. When the switch is in the off position, the transmission will be in the conventional range, have "free wheeling" and no-clutch shifting. If it is desired to have the transmission operate in the regular manner, a three-pole switch can be wired into the circuit as shown in the lower circuit in the wiring diagram.



Coin Provides Equal Spacing of Lines When Using Triangle



When it is necessary to rule a series of equally spaced lines with a triangle, a coin smaller than the opening in the triangle can be used to accurately space the lines. Draw the first line, holding the coin inside the triangle against the side being used. Then move the coin to the opposite side of the opening, holding the triangle firmly in place. Next, hold the coin and move the triangle. The distance between the coin and the triangle will, of course, determine the distances between the ruled lines.

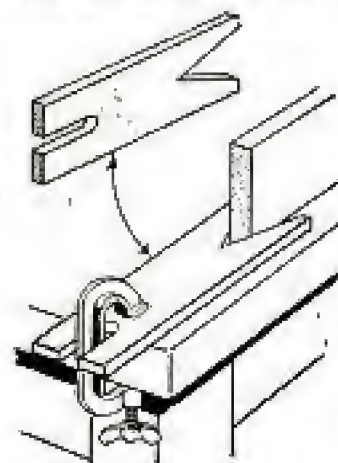


Ladder Rest on Lamp Standard Provides Safety Factor

Welded to an outdoor-lamp standard just beneath the light, a 2-ft. length of pipe will provide a ladder rest which is a definite safety factor when changing the bulb or cleaning the reflector. When the ladder is placed against the rest it will not have the tendency to twist or slip sideways, as when rested directly against the standard.

Bob Poulson, Los Angeles, Calif.

Bench Stop Held With C-Clamp



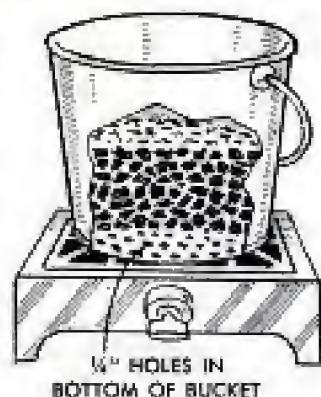
A bench stop cut from $\frac{1}{4}$ -in. plywood, and clamped in place, will eliminate the need for nailing cleats or blocks to the top of your workbench. One end is slotted to straddle a C-clamp, and the other end is V-notched to take the work, as shown in the detail.

Wire Coat Hanger Bent Into Hook Used as Paintbrush Rest

Shaped from a wire coat hanger, this simple hook provides a means of holding a brush on the edge of a paint can. Easily slipped in or out of the hook, the brush will not be submerged in paint nor fall on the floor. The hook of the coat hanger is bent at right angles to its original position and shaped to fit over the brush handle. The cross bar of the hanger is cut in the middle and the hanger then is wrapped around the paint can. The cut ends are twisted together and the excess wire snipped off.—Ken Murray, Colon, Mich.

Charcoal Fired Over Gas Flame To Assure Quick Blaze

Charcoal, which is sometimes difficult to ignite, may be pre-fired to assure a quick blaze in your barbecue pit or brazier. Place the charcoal in an old heavy-duty bucket which has holes punched in the bottom. Set the bucket on a gas burner over a high flame for 5 or 10 minutes, then remove to the fire. To prevent particles of charcoal from sifting into the gas burner, shake the bucket thoroughly before placing on the stove.—W. S. Head, El Cajon, Calif.



Holder for Small Drill Bits Made From Tobacco Can

A practical holder for small drill bits may be made by punching a number of holes through one side of a tobacco can. The can is fastened over the workbench in a horizontal position.

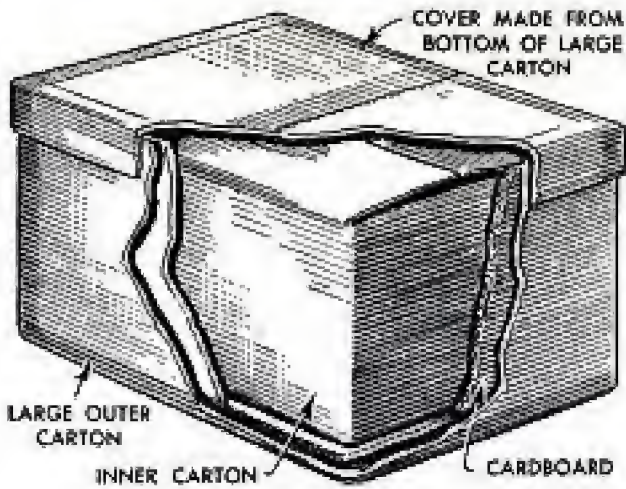


Clothespin Holds Table Cloth

To prevent wind from disturbing the cloth on any outdoor barbecue or picnic table, screw a spring-type clothespin under each corner of the table. After the cloth is spread on the table, the corners are clamped into the clothespins, eliminating tacks or weights to hold the cloth in place.

Norm Jacky, Fond du Lac, Wis.





DISPOSABLE ICEBOX FOR PICNICS

For an impromptu outing or other occasion requiring an emergency icebox, try the one pictured. It costs nothing to make and can be discarded after serving its purpose. The icebox consists of one cardboard carton set inside of another, with space between them for more cardboard or crumpled newspaper as insulation. A cover for the box is made by cutting the bottom from a slightly larger carton and fitting it over the assembly. To chill the contents of the box, make a dripless "cake of ice" by filling a quart can with water, coffee or some other beverage, allowing room for expansion, and freezing it in the ice-cube compartment of the refrigerator. When the liquid is frozen solid, the can is capped and put inside the box to keep the contents cool. It will provide refrigeration for five or six hours if the box is sealed with gummed tape after packing. Ice cubes and frozen foods may be kept frozen longer if they are wrapped in several layers of newspapers before being put in the icebox.

John Jobson, Hollywood, Calif.

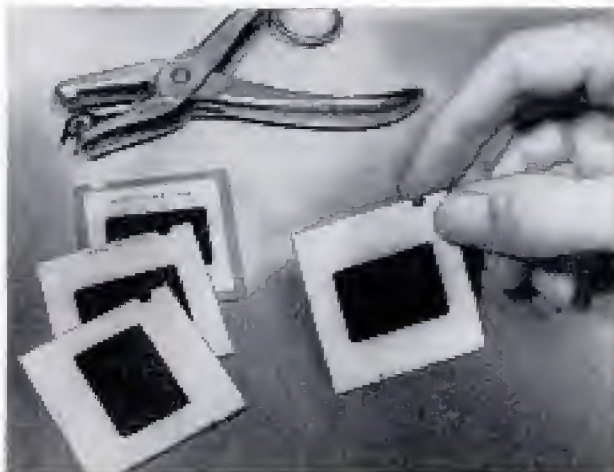


Above, can in which a beverage has been frozen is packed along with perishables to provide refrigeration for five or six hours if the box is sealed with tape



Cardboard from cut-up box is inserted between inner and outer cartons, above, to act as insulation

Notch Cut in Cardboard Mounts Aligns Slides for Viewing



To avoid projecting or viewing a color transparency upside down or reversed, hold the picture in its proper position and notch the upper right hand corner of the cardboard mount with a paper punch. The notch will permit proper positioning of transparencies for insertion in the viewer, even in a darkened room, by feeling the notch with the fingers. This idea also could be used to aid in storing the transparencies in the proper position.

☞ Before putting lawn furniture outside in the spring, give it a coating of household wax to protect it from the weather and make cleaning easier.

SAVE \$100 on your NEXT VACATION



By Ron and Marion Anderson

STOP FOR THE NIGHT when and where you wish, and at the same time stretch your vacation budget, by building a bed right into your car. We did it, and now find that vacation costs average \$100 less because the cost of sleeping accommodations is cut down. We never have to wire ahead for reservations and there is no more stopping in the middle of the afternoon in order to secure accommodations for the night. Figures issued by some of the state tourist bureaus show that more and more people are making their homes for the night wherever they park their cars.

Installing a bed in most cars is easy. It took us less than an hour to make the installation in our 1951 Ford. First remove the back seat and then take out the fiberboard partition behind it. Next, take out the two steel diagonal braces by cutting them free with a hacksaw. These may be replaced later by bolting them back into place, using small steel angles and reinforcing plates that can be purchased at any

After the back seat is taken out and the diagonal braces are removed, bed is installed through trunk

Adequate space for storing spare tire and luggage is available under the bed and at the foot in trunk



hardware store. However, we never did put them back, and after two years the car body shows no signs of weakness.

The next step is to buy a steel-frame twin bed with flat springs. Sand and paint the frame, and then slide it into the car through the trunk. Since the standard twin bed is 39 in. wide, it should fit through the trunk opening easily. However, to be certain, take the measurements from your car before selecting the bed, or you may have to cut it down. This isn't difficult, but it is extra work that might be avoided. Either an innerspring or stuffed mattress can be used. We chose the stuffed type because it was thinner and took up less room, yet provided plenty of comfort.

With the mattress on the bedframe there is still room to dress at the side of the bed, and space under the bed and at the foot for luggage and the spare tire. Screens may be installed in the back windows by removing the metal window frames or trim, taping plastic screen wire in place, and then replacing the frames. For privacy, shades can be made for the windows by cutting cardboard to the size of each window. This is taped over the window at night and stored at the head of the bed during the day.

Although much of the convenience of traveling with a car bed comes from being able to stop when and where you wish, you may prefer to park overnight at one of the hundreds of trailer camps dotting the country. Standard rate for parking your car and using toilet and shower facilities is \$1 for the night. Camp sites are available in national and state parks. And often large restaurant and gas-station stops have places for you to park. In addition, with your car as a sturdy, weatherproof "tent," you can have all the pleasures of camping out.

Screens for rear windows are provided by taping plastic screening in place after removing window frames



JULY 1954



Above, bed is shown in place and made up ready for use. There is space for dressing beside the bed



Strip of hardboard 4 in. wide is taped across front of shelf under rear window to keep articles in place

As window frame is replaced, screen is stretched and made smooth. Window still can be opened and closed



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Folding Flowerpot Stand Cut From Plywood

A flowerpot stand that can be slipped together in a few moments and disassembled for storage just as quickly can be made from light plywood or hardboard. The two body pieces are slotted centrally to fit into each other at right angles. The upper edges of these pieces are recessed to take the circular top which is notched to take the tabs of the body pieces. Glue applied to all joints will make a permanent job, if desired. The same design in heavier wood can be used as a child's stool, or in cardboard, as a display stand, to be used when window dressing.

Wax Coating on Steel Rule Retards Rust and Wear

By applying a coating of paste wax to both sides of a steel retractable rule you not only can "lubricate" its movement but also retard the formation of rust. Apply only a small amount of wax and then wipe it off lightly with a clean, dry cloth. This leaves an almost invisible coating remaining which is sufficient for the purpose.

Glen F. Stillwell, Manhattan Beach, Calif.

About Water That's Too Soft

Surprising as it seems, a great many of common plumbing troubles often are caused by water that is too soft—corrosive water that even attacks copper and brass. Biggest problem is that most people think hard water to be the culprit and correct accordingly. But, find out for yourself in next month's story

Vines Tied to Wall or Trellis With Pipe Cleaners

Vines that are slow to "take hold" on a wall or trellis, can be tied in place by pipe cleaners, which are ideal for this use because they are not likely to damage the vine. To attach the pipe cleaners to a brick wall, tie them to projecting nails

driven into the mortar joints. On a trellis, they are simply tied to the lattice work.

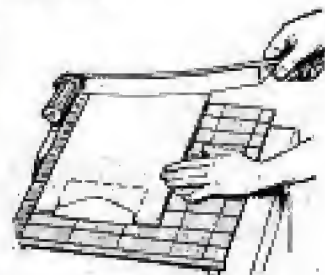
Hi Sibley, Nuevo, Calif.



Envelope Holds Sheets of Paper For Accurate Trimming

When trimming a number of sheets of paper on a cutting board, you can hold them together evenly by slipping the flap of an envelope over one edge of the sheets.

Tap the envelope on a flat surface once or twice to square up the sheets against it, then hold the paper firmly on the board for cutting.



Bulb Carried in Flashlight Provides Emergency Spare

You won't have to grope in the dark when a flashlight bulb burns out, if a spare bulb is carried in the end cap of the case. A piece of friction or adhesive tape will hold the bulb in place and allow it to be removed easily.



Unaffected by photo chemicals when hardened, tire filler can be used to mend cracks in plastic developing tanks and trays.

DRYING GLOSSY PRINTS

By Wallace Hanson

TRYING TO GET a mirror finish on your snapshots or enlargements can be a frustrating chore, especially if you are just beginning to process your own pictures at home. First attempts generally result either in the prints sticking to the plate like glue or drying unevenly, spotty and wrinkled. Obtaining a perfect gloss on your prints is more tricky than difficult, and most home photo finishers will do well to remember that a chrome or enameled ferrotype plate is a piece of photo equipment that should be "pampered" once it is conditioned to turn out prints of professional quality. Follow the tips used by the experts.



Chrome-on-brass ferrotype plate is preferred to steel as it will not rust. Wash away grit under cold water

Below, hold each print separately under running water to rid it of grit, sediment and other foreign matter that may have collected on it. Specks may remain to mar glossy finish when prints are merely transferred from washing pan directly to ferrotype plate

Below, place print face down on ferrotype plate and run a stream of cold water between print and plate. This forms cushion of water between the two, eliminating air pockets and providing a perfect bond between print emulsion and the ferrotype plate



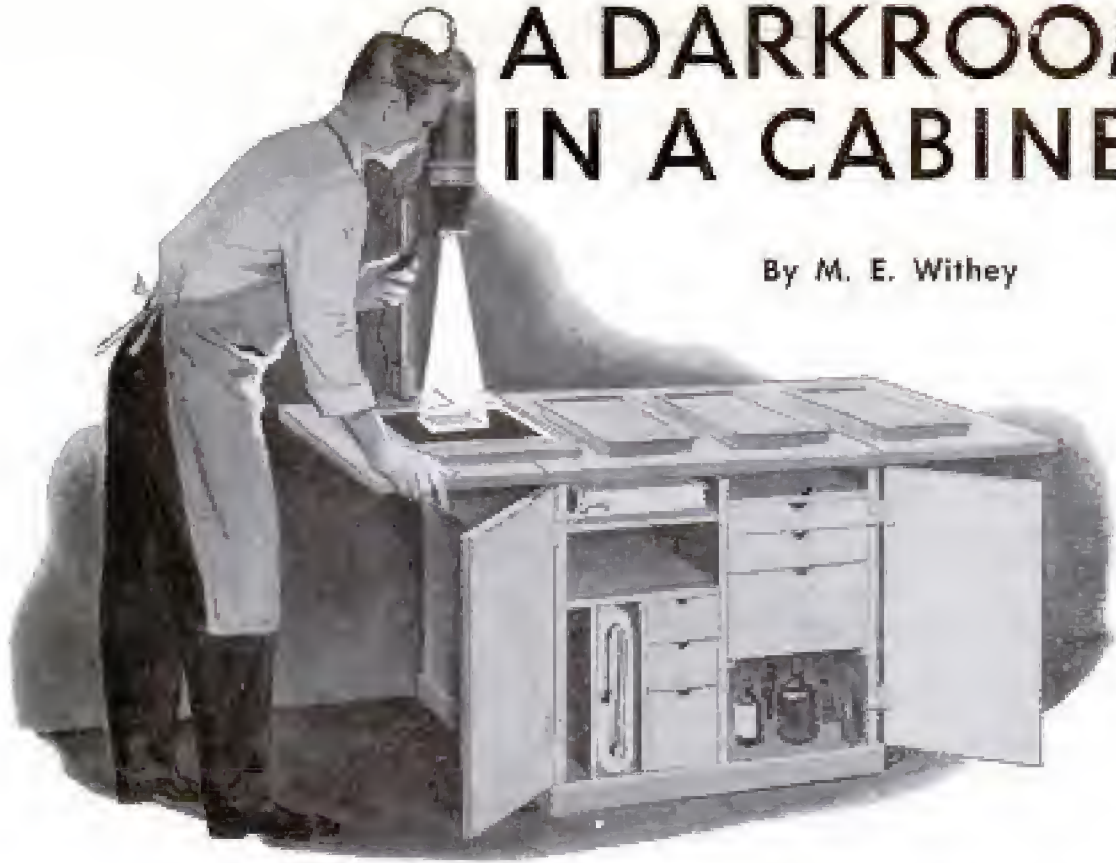
Below, turn a print tray upside down and place ferrotype plate on it. Wipe print against the plate with a wide-blade squeegee. Pan allows excess water to drain off without chance of water running back under print along with dust to mar the glossy finish

Below, when using a chrome plate and electric drier, leave prints covered until canvas feels dry. Removing cover too soon will oyster-shell the gloss. Don't use black enamel plates in drier. Instead, place the plate under blotter and dry at room temperature

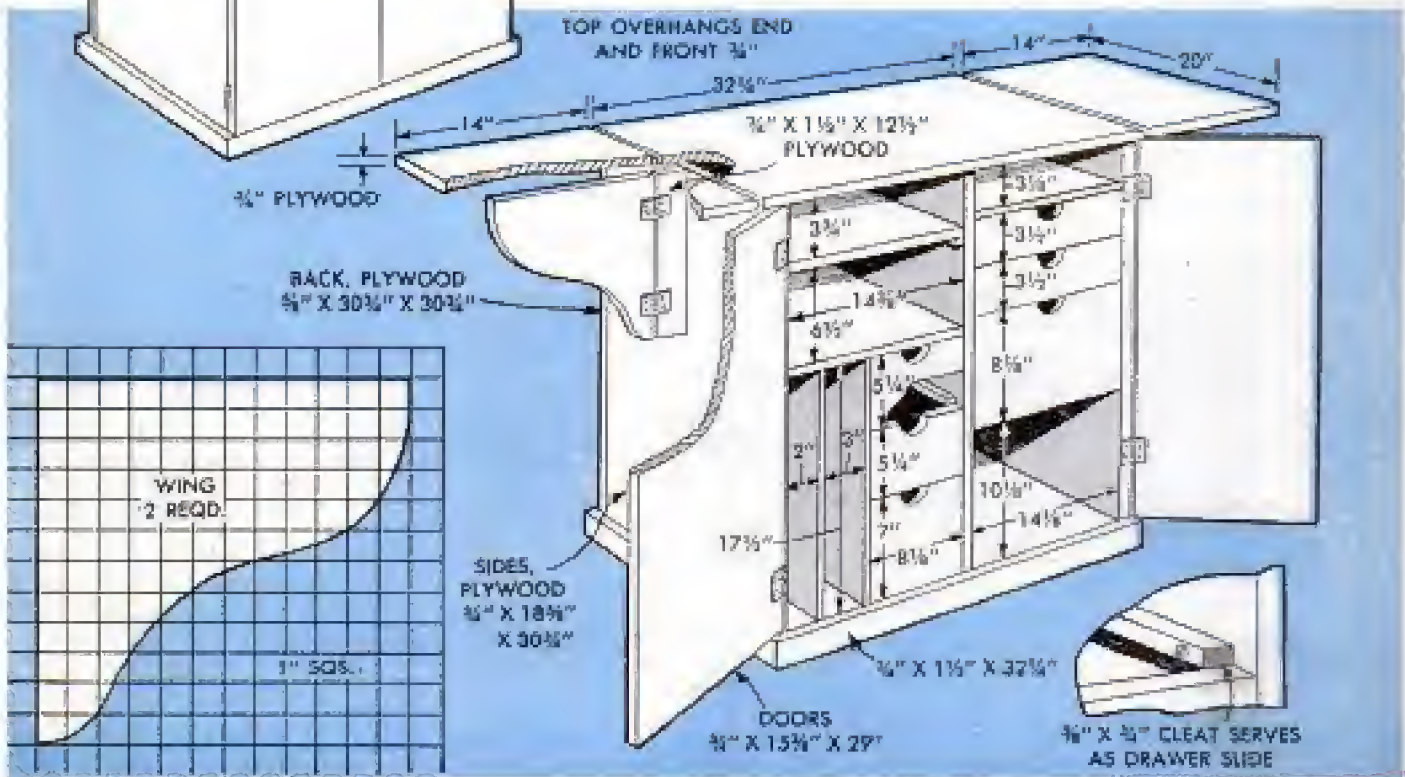
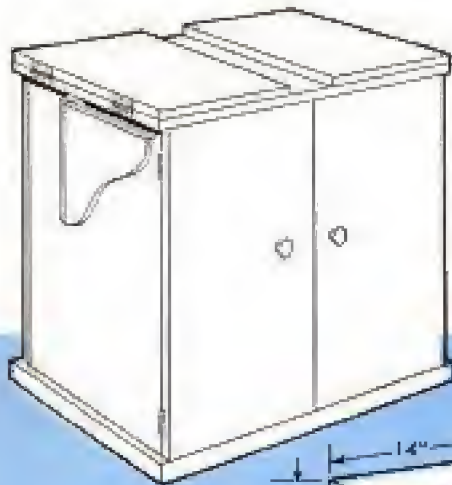


A DARKROOM IN A CABINET

By M. E. Withey



THE LIMITED DARKROOM space available to many amateur photographers is utilized to full advantage by this compact storage cabinet and work counter. The cabinet, when closed, occupies only 20 x 32 1/4 in. of floor space, yet when the two 14-in. extension leaves are open, a work surface 60 1/4 in. long is provided. The larger pieces of equipment fit neatly inside the cabinet; the enlarger and paper trimmer

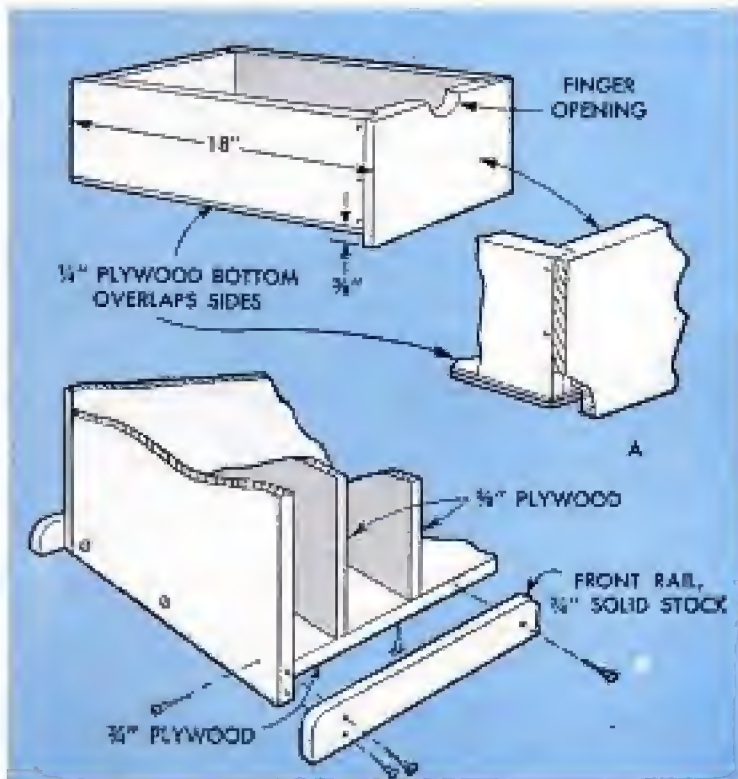


fit on two horizontal shelves, the enlarger base and easel and the print drier, in two vertical bins. Except for the drawer slides and the floor rail, the cabinet is cut from easily worked plywood. Although the detail shows the floor rail to run on three sides of the cabinet, it actually is necessary only at the front, where it is flush with the closed doors. The detail below shows a third way of adding the rails across front and back. The sides of the cabinet extend to the floor, while the top of the bottom shelf is $1\frac{1}{2}$ in. above the floor. Hardboard can be substituted for the plywood used for the back.

All joints should be glued and fastened with wood screws to insure a rigid structure. Piano-type hinges may be used to hinge the extension leaves, although plain butt hinges will do. In attaching the hinges, drive the screws into the edges of the $\frac{3}{4}$ -in.-plywood top.

As shown in the detail of the drawer, the front panel of each drawer extends $\frac{3}{8}$ in. below the bottom of the drawer to allow for the slides. The dimensions given for the cabinet will fit the storage requirements for the average pieces of equipment, but it is wise to check the size of your own equipment to be sure it will fit in the cabinet.

Linoleum or plastic laminate should be used on the top surfaces to protect the wood from photographic chemicals. The cabinet itself may be stained or painted to match or contrast with any room decor. The inside, as well as the outside should be varnished or painted. ★ ★ ★



Black Paper Helps in Computing Exact Diameter When Enlarging

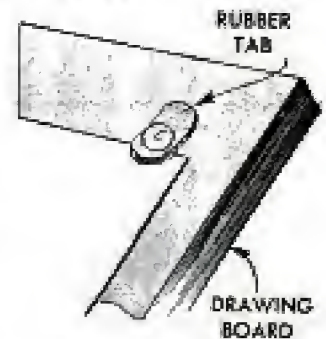


If your enlarger post is not calibrated to permit enlarging to an exact diameter quickly, substitute a strip of black paper 1 in. long for the negative. Focus sharply, and then measure the projected image with a ruler. An image 3 in. long indicates a 3-dia. enlargement, a $3\frac{1}{2}$ -in. image a $3\frac{1}{2}$ -dia. enlargement, and so on. Computation of odd sizes is thus simplified.

R. F. Donovan, Guttenberg, N. J.

Rubber Tabs Hold Paper on Board Without Puncture Marks

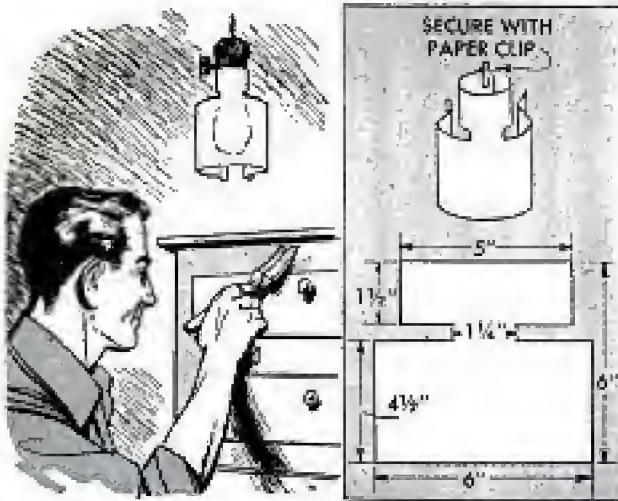
Sheets of paper or card stock can be held on a drawing board securely, without being defaced with the usual thumbtack punctures, by using rubber tabs as illustrated. The tabs are held on the board by thumbtacks. To use such tabs, push the thumbtack through the tab and then start the tack into the drawing board. Slip the edge of the paper or card under the rubber and force the tacks down.



Small Sheets of Clear Plastic Made From Old Negatives

Old cut-film negatives will provide the modelmaker and hobbyist with excellent sheets of clear plastic. The emulsion is softened by immersing the film for 5 min. in a solution of glacial acetic acid, 100 drops, and water, 1 pint. The emulsion then is wiped off with a cloth.—Henry A. Miller, Orpington, Kent, England.

Reflector for Drop Light Cut From Tin Can



The glare of an exposed light bulb on an extension cord or drop cord can be shielded by means of a reflector cut from light sheet metal or asbestos paper. A medium-size tin can will furnish enough sheet metal for the reflector. It can be cut to the dimensions given in the detail and bent to a "spring" fit and clamped around the socket. If asbestos paper is used, a paper clip will hold it in place.

Ridding Yard of Ants

Wishing to destroy ants in several large ant hills in his yard, one homeowner inverted a flowerpot over each hill and poured a small amount of carbon tetrachloride through the hole in the bottom.

The resulting fumes exclude all the oxygen inside the pot almost immediately, thus killing the ants covering the hill as well as many caught near the surface.

John A. Comstock, Wellsboro, Pa.

Paint Mark on Adjustment Wheel Permits Easy Thermostat Check

A small dot of paint or nail polish on the adjustment wheel of a room thermostat will provide a means of quickly checking to see if the furnace has been set for the correct temperature. Paint the dot at the temperature setting which is normally used. If the thermostat is to be checked at night, luminous paint might be used.

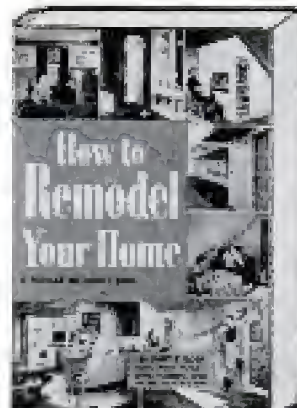


Popular Mechanics Bookshop



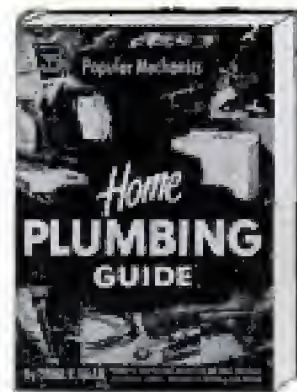
Home Repairs

HERE IS a book filled with hundreds of photographs that show you just how to save money doing your own home repairs. In cloth bound \$2.50



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NOW IS the time to give your home the "face lifting" it needs. And it's so simple with this up-to-the-date book. Can be purchased at the newsstands for only 75c



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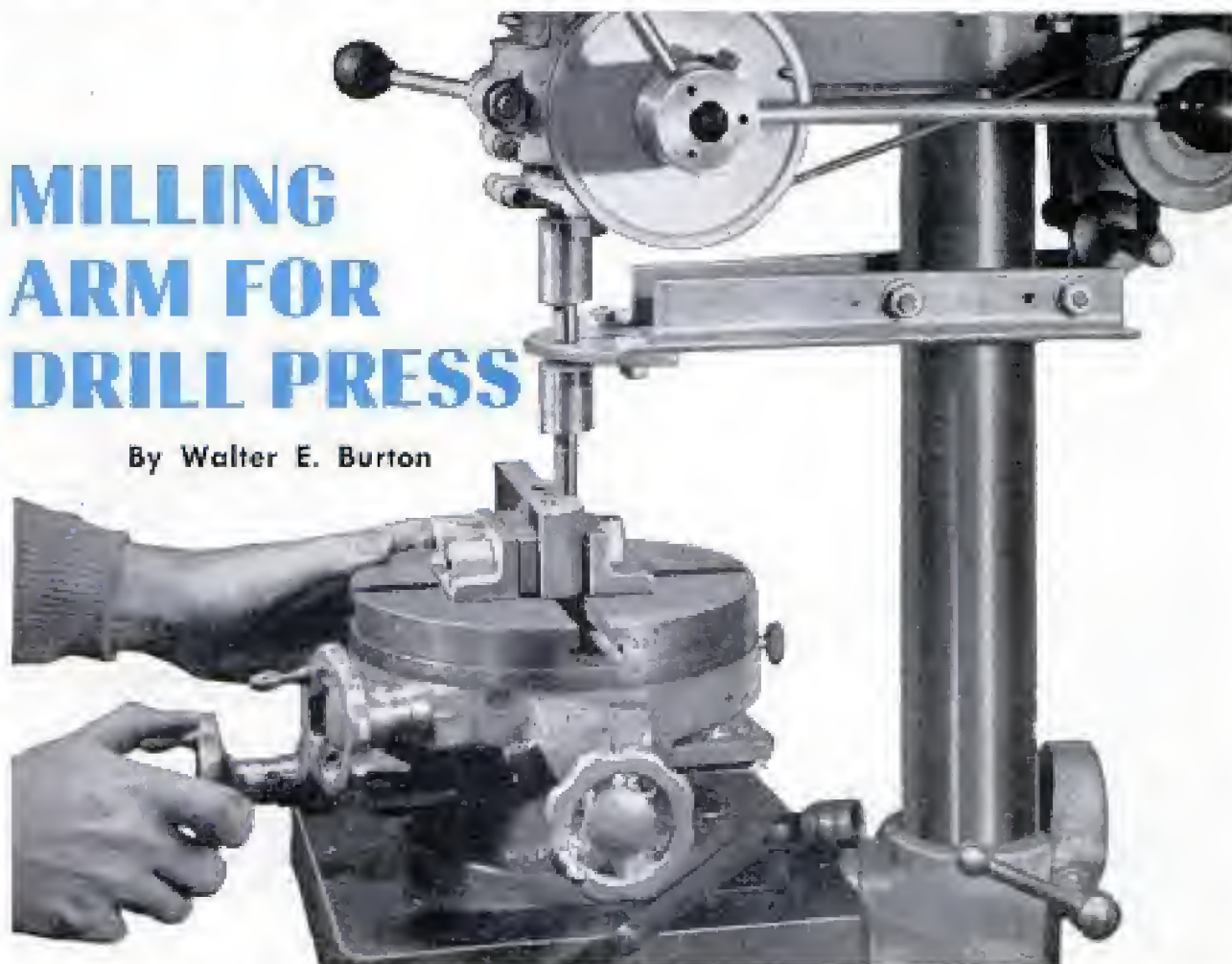
All books available from Popular Mechanics Book Dept., 208 E. Ontario St., Chicago 11, Ill.



SHOP NOTES

MILLING ARM FOR DRILL PRESS

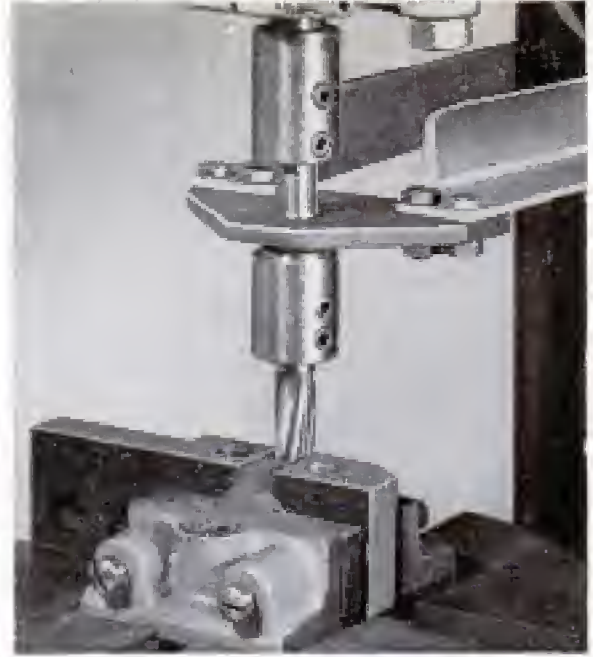
By Walter E. Burton



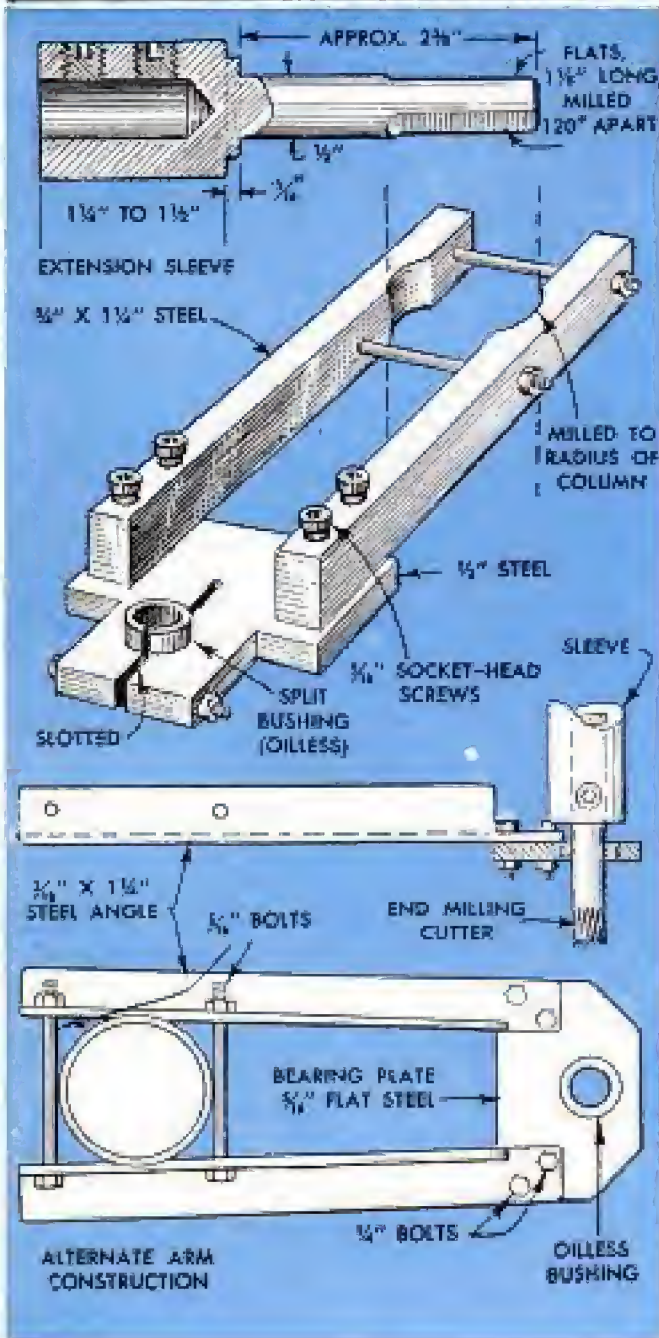
BY ADDING a milling arm which provides a bearing for carrying heavy lateral thrust, your drill press can be made to serve as an accurate vertical milling machine for light work. The arm, pictured in position in the photo above, is clamped to the drill-press column and supports the auxiliary sleeve chuck in the manner shown. The auxiliary chuck can be driven by a conventional drill chuck or by means of the interchangeable spindle furnished as an accessory with some types of drill presses. The accessory spindle is shown in use in the photo above and also in the upper right-hand photo on the following page.

For an occasional job the arm can be made from light steel angle as pictured, but for more accurate repetitive work the supporting arms should be made from $\frac{3}{4}$ x $1\frac{1}{4}$ -in. steel with the split sleeve bearing held in a $\frac{1}{2}$ -in. steel plate as in the center detail on the following page. Slotting both the holder and the bearing provides an

adjustment for eliminating any side play in the bearing. Shallow concaves must be milled or filed in both arms so that they can be clamped rigidly to the drill-press column. This operation must be done with care so that when in position the arm is precisely at right angles to the axis of the drill-press spindle. Before the final filing of the concaves, make the extension sleeve as in the upper detail on the following page. Note that the detail shows three flats milled (or filed) on the shank of the sleeve. These are 120 deg. apart so that the chuck jaws will close on a flat surface to give adequate driving power without any slippage. Machine the extension to the dimensions given from one piece of tool steel and drill and tap for set screws as indicated. When used with an accessory drill-press spindle, as pictured, only one flat is necessary and it should be slightly longer than indicated in the detail. Machine the lower end of the shank to a close fit in the bearing, bringing it down to the final



Above, left, drilling the hole in the bearing plate for the bushing. Hole later is reamed to take bushing. Right, unit in operation taking cut across thickness of work. Note spiral cutter

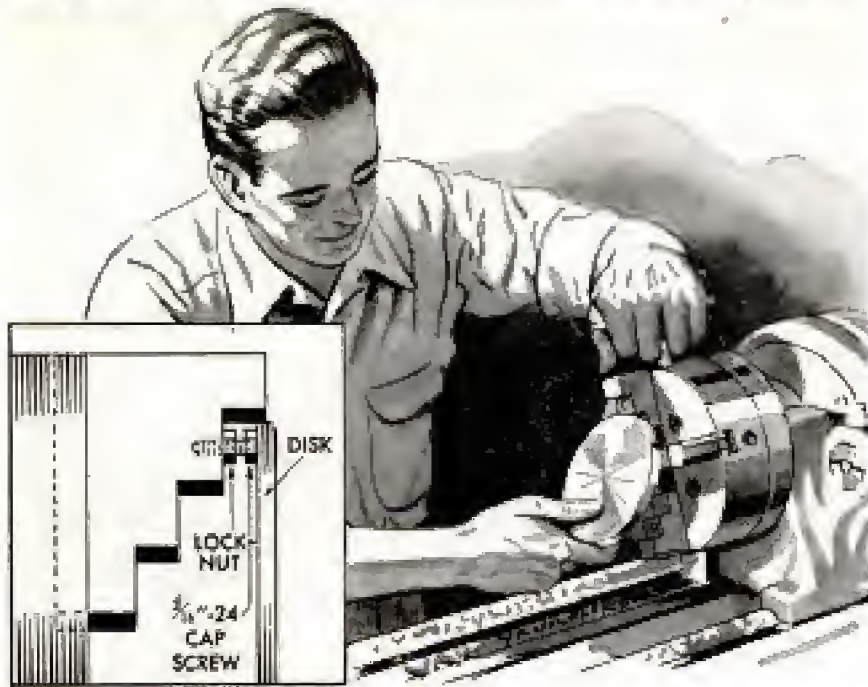


dimension with a fine file if no lathe grinder is available.

Then make a trial assembly of the completed arm with all parts in place, including the extension sleeve. Rotate the spindle by hand to check for runout in the spindle and extension. Slight misalignment in either the vertical or horizontal plane will cause binding. Correct any such tendency by filing the concaves until the rotating parts turn freely. Be sure to tighten the spindle lock each time the parts are tested. If you are building the heavier-type unit, center detail at the left, adjust the split bushing by tightening the clamping bolt to take out any side play that may cause chattering when milling the harder metals.

For average work in both hard and soft metals, the four-lipped end mill with a straight shank generally gives best results. These come with straight and spiral flutes and in certain soft metals the spiral-fluted cutter usually gives the smoothest cut. However, either type can be used with good results. In the right-hand photo, above, a spiral end mill is pictured taking a typical milling cut across the narrow width of the stock. The universal table, pictured in the left-hand photo above and also on the preceding page, feeds in two directions, right and left and in and out, by handwheel feed. The platen also rotates by hand feed. The work is held in a special clamp as shown. Other types of clamping fixtures can be attached to the table when necessary. ★ ★ ★

Depth Stop on Lathe-Chuck Jaws Speeds Setup of Thin Stock



When a quantity of thin disks are to be faced-off in the lathe, setup time can be kept to a minimum by fitting each jaw of the lathe chuck with an adjustable depth stop. Drill and tap the first step of each jaw to receive a $\frac{3}{16}$ -in. cap screw. A locknut is screwed onto each screw to hold the adjustments at any predetermined point. The adjustments are made with a depth gauge and measured from the face of the jaw. It may be necessary to temper the jaw to permit drilling and tapping. — E. J. Gilkerson, Columbus, Ohio.

Pigeon-Hole Cabinet Keeps Bolts Sized for Instant Selection

Copying an idea from a hardware store, one farm owner built a pigeon-hole cabinet for bolts and similar parts in his farm shop. With everything neatly sorted and sized, finding a particular bolt or part takes only a moment. The size of each section in the cabinet would vary for individual needs, but the cabinet pictured is made of 1-in. stock and each section is a 5-in. cubical. The vertical and horizontal strips were half lapped at each intersection to make the cabinet of interlocking construction. A $\frac{1}{2}$ x 1-in. strip is nailed across each horizontal row to aid in holding the parts that are stored in each bin.

A. M. Wettach, Mt. Pleasant, Iowa.

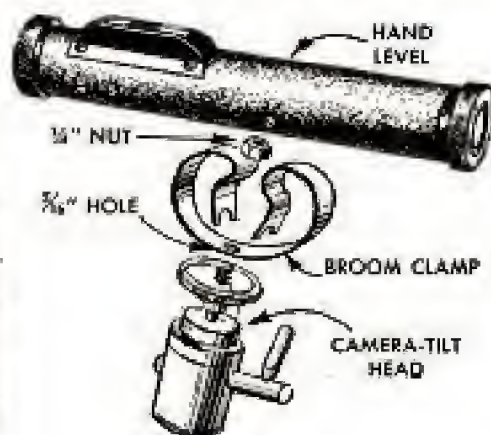


Improvised Builder's Level Used in Running Grades

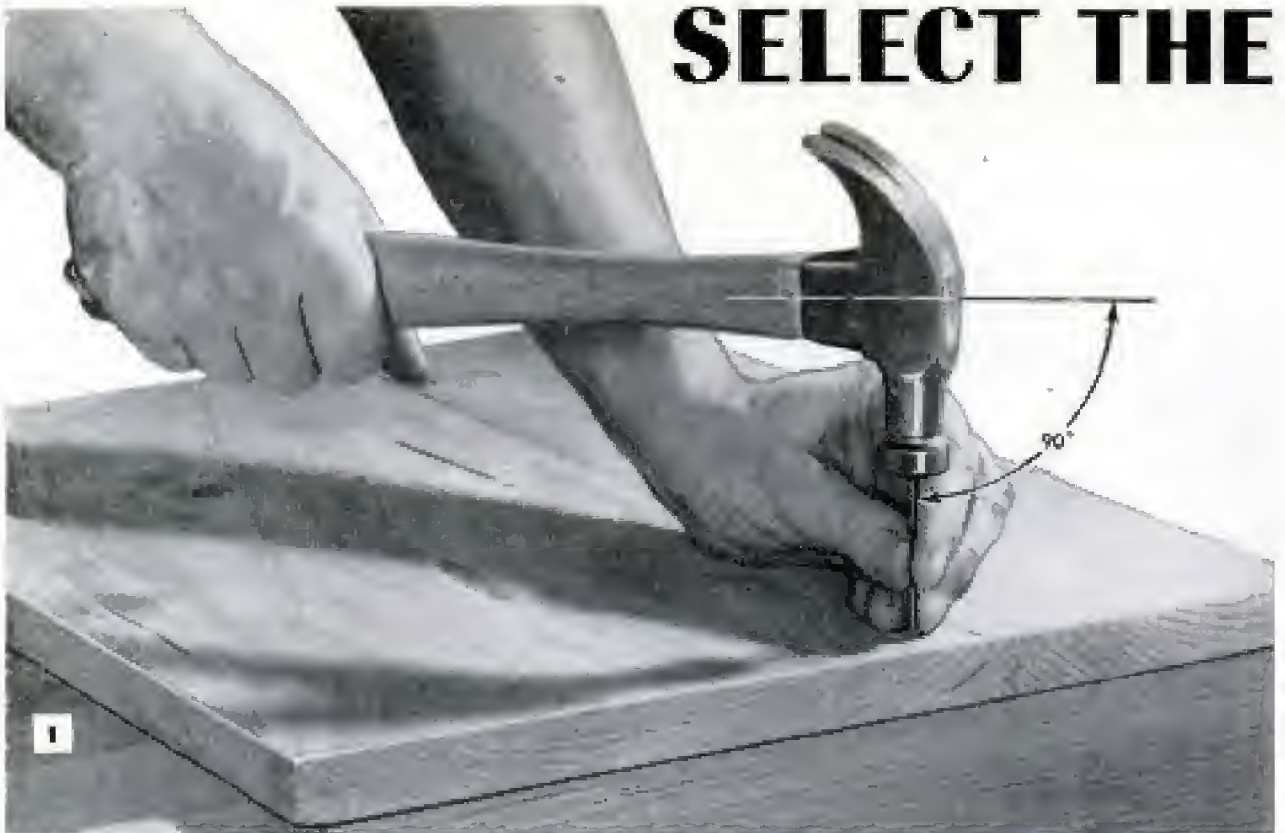
A simple and inexpensive construction level for setting house foundations, concrete forms and for laying out farm terraces and ditches can be assembled quickly

from a hand sighting level, a broom clamp and a camera tripod fitted with a tilt head. The level must be of the optical type having adjustable magnification. Enlarge the screw hole in the broom clamp and fit the clamp over the threaded stud at the top of the tilt head. Fasten it in place with a hex nut as shown. When assembled in this way the clamp holds the level sufficiently rigid for all practical purposes and the tilt head provides a fine adjustment when needed. Hand-sighting levels of the type required can be bought from mail-order houses.

Tom Riley, Portland, Ore.



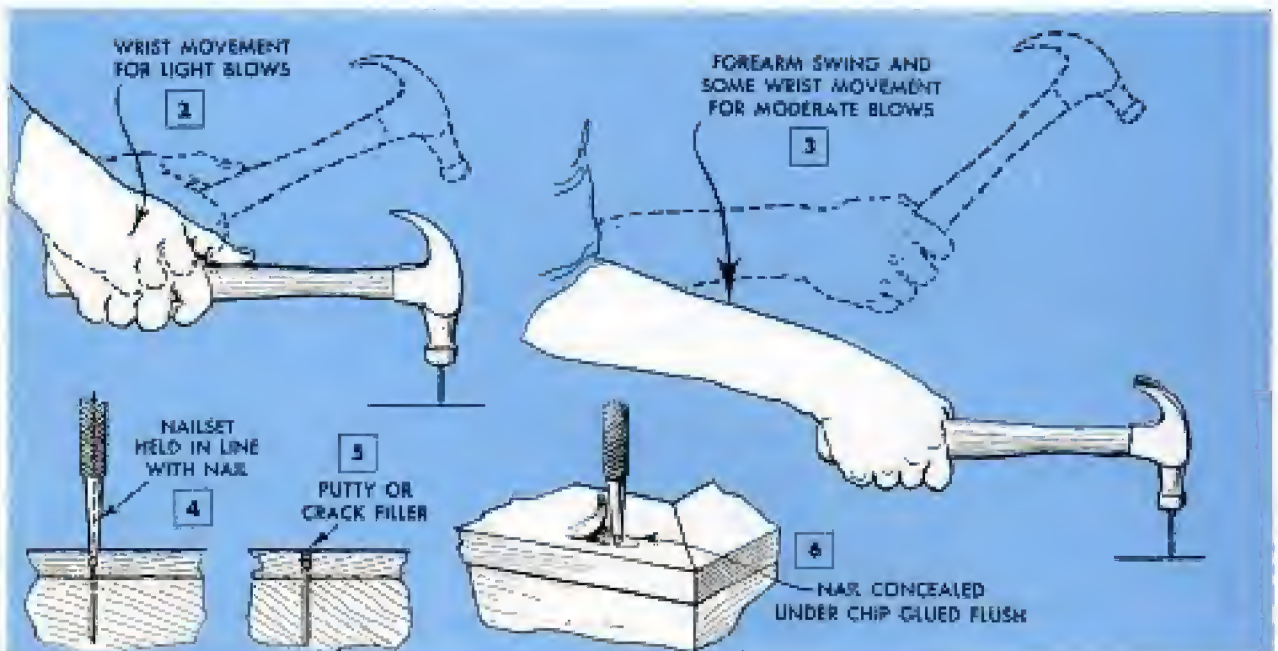
SELECT THE



THERE ARE NOW over a hundred types of nails available and from these you can select a nail for any specific job where nails can be used as fasteners. They are obtainable not only as types but also in many sizes in nearly all types. In addition to variations in shape and size, nails are supplied in varying degrees of hardness for special purposes. When exceptional holding power is necessary, as on parts which will be subjected to unusual strain or vibration, it is advisable to use adhesive-coated, etched or barbed nails. Where rust is likely to cause discoloration of the work

or affect the holding power of the nail, it's a common practice to use Parkerized, cadmium-plated or heavily galvanized nails in a size and type suited to the requirements. In some cases stainless steel, copper, bronze or aluminum nails will best serve the purpose. An example is the use of aluminum nails for attaching wooden siding. Aluminum nails do not corrode and the heads of the nails can be painted over without any special treatment to prevent rust and the resulting discoloration of the paint.

Hammers: Nearly all types of common nails can be driven with a single hammer



SN 56

RIGHT NAIL

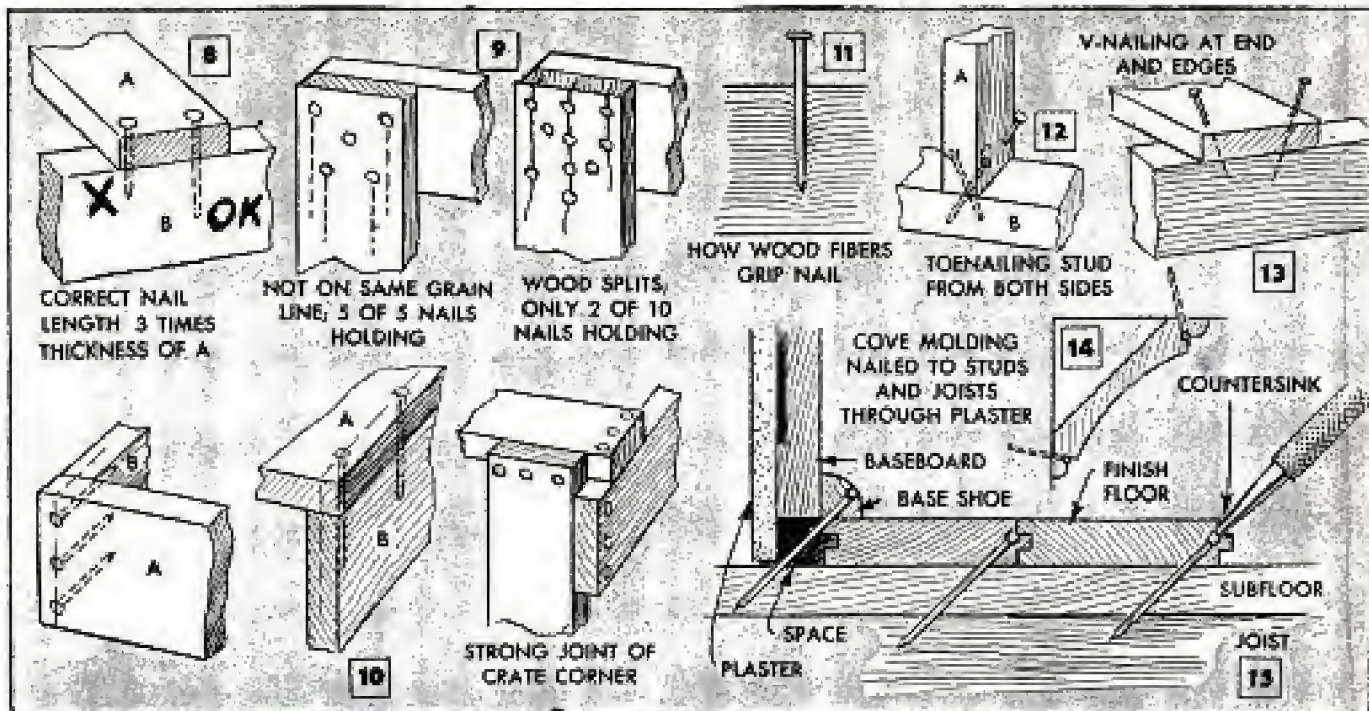
By E. R. Haan



Nailing techniques and kinds of nails are varied to suit the job to be done

having the weight and balance that suits the user's individual preferences. Hammer-head weights in the standard types range from 7 to 28 oz. with the 13 and 16-oz. heads an all-around choice of carpenters and others who use hammers for nail-driving exclusively. For delicate work, such as nailing flooring and trim in building construction, carpenters generally prefer a hammer with a lighter head as it is more easily controlled. A high-grade nail hammer, or claw hammer as it is commonly called, will have a highly finished head with claws of a uniform length, the poll will have a 2-deg. toe-in and the handle will be correctly shaped to provide the user with a comfortable hand-hold in the proper position in relation to the length of the handle. These points of construction give a hammer what experienced users call hang and balance, quality features that determine its accuracy and ease of handling. For ordinary work the face of the poll is crowned slightly and the edge beveled all around. For some specialized jobs the poll is checkered. Fine, sharp checkering on the face of the poll prevents it from slipping off the head of the nail when working under difficult conditions. Figs. 1, 2, 3 and 16 show how to hold a hammer when delivering both light and heavy blows. An important point in correct handling is brought out in Fig. 1. Note that the axis of the hammer is approximately at right angles to that of the nail as the blow is completed. If the handle is a few degrees down or up, the head of the hammer may "glance" off the nail and injure the fingers or bend the nail. If the hammer has the correct balance and weight for the job, it will fall naturally



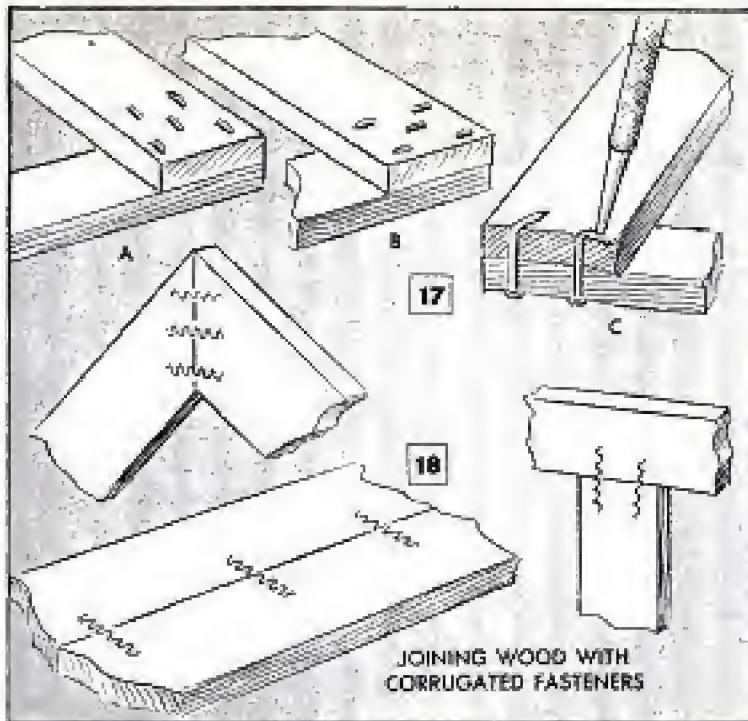


into this position at the end of the stroke. When light blows and positive control are necessary, it's a common practice to grip the hammer handle as in Fig. 2, with the thumb extended along the handle, as indicated. On the other hand, when it takes the maximum arm swing to deliver a series of heavy blows, the arm action will be smoother if the handle is gripped as in Fig. 3.

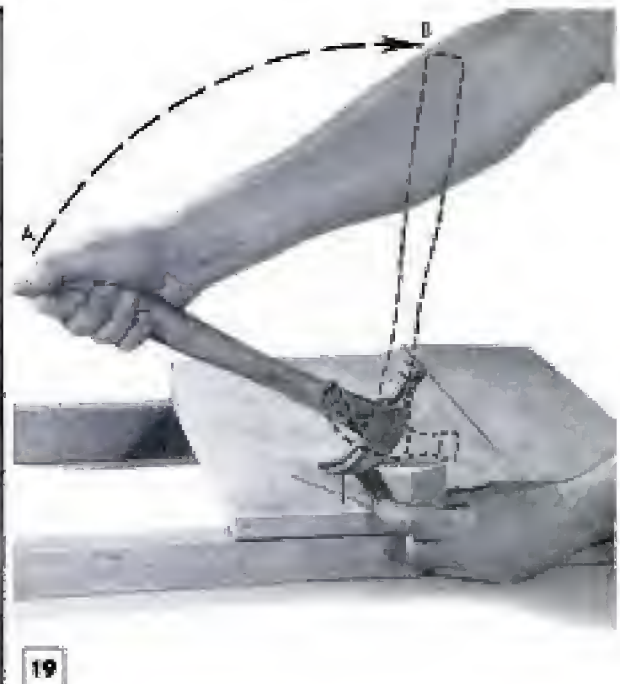
General-purpose nails: The measure of the length of common nails is indicated by an old symbol, the letter "d," meaning

penny. The d-sizes range from 2d to 60d. The 2d to 16d nails increase by $\frac{1}{4}$ in., as in the table on page 198. Those above 16d increase by $\frac{1}{2}$ in. The common wire nails, detail A, Fig. 7, are used mostly for joining house framing. Such nails should not be used on siding or in joining any other part of the structure where they will be exposed directly to the weather. Use aluminum or copper nails in exposed places. Note the similarity between the common nail and the box nail, detail B, Fig. 7. The finishing nails, details C, D and E, Fig. 7, include three types which vary in gauge and also have slight variations in the shape of the heads. The heads of these nails are cupped slightly, detail F, to hold a nail-set when setting the heads below the surface, as in Figs. 4 and 5. Ordinarily, the holes made by setting are filled with putty or a crack filler, but on fine cabinet work the heads often are blind-set as in Fig. 6. Flooring nails have blunt points for easier driving with less tendency to split the hardwood. Casing nails, detail C, have tapered heads and are used for interior trim and cabinet construction. On exceptionally fine work in hardwoods, finishing nails often are used instead of casing nails. They are smaller in diameter and have smaller heads which can be sunk below the surface with a nail-set with less tendency to split the stock.

Nailing procedures: Nails driven too close to the edges or ends of stock are likely to split the wood, details H and I, Fig. 7. When edge-nailing as in detail J, adverse grain may force the point of the nail sideways so that it breaks out on the face of the stock. When starting nails under these conditions be sure that the nail is centered. In certain hardwoods, such as



JOINING WOOD WITH CORRUGATED FASTENERS



19

oak, it is advisable to drill a pilot hole slightly smaller than the diameter of the nail, or use a nail with a V-point, detail M. Often it is necessary to drive a nail through a knot as in detail L, Fig. 7. A pilot hole will prevent splitting of the stock. For maximum holding power on wood-to-wood joints, it's a common rule that the nail length should be three times the thickness of the piece being attached, detail K, Fig. 7, and A and B, Fig. 8. Whenever it is necessary to set flat nailheads use a flat-face punch as in detail G, Fig. 7. When joining two pieces of wood of equal width at right angles, as in the right and left-hand views in Fig. 9, take careful note of the direction of the grain. Then drive the nails so that no two of them are on the same grain line. Note the center line on the parts A and B in Fig. 10, the left-hand view, compared with those on the parts A and B in the center view. In both types of joints it is essential that the nails be centered through both pieces of stock. In hardwood this should be done by means of pilot holes drilled through the pieces A, the holes entering the pieces B about $\frac{1}{4}$ to $\frac{1}{2}$ in. to guide the points of the nails.

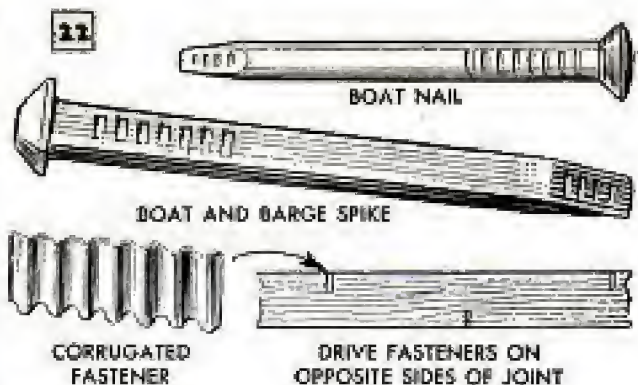
The holding power of a nail is due to the wedging action of the wood fibers, Fig. 11. This varies very little in average work even though the nails are driven into the wood at an angle as in toe-nailing a stud, A, to the plate or sill, B, Fig. 12, or in V-nailing as in Fig. 13. Another example of V-nailing, or angle nailing, is that of joining flooring to the subfloor as in Fig. 15, also the base shoe in the same detail. In attaching cove molding, Fig. 14, it sometimes is necessary to drive nails at an angle. Nails can be clinched across the grain or with the grain as in details A and B, Fig. 17. Usually they are more easily clinched with the grain, as in detail A, but they do not hold as well and there is always the possibility of splitting the wood. When nails must be clinched flush with the surface, turn the points with a hammer, then clinch flat with a nailset as in detail C, Fig. 17.

Special-purpose nails: Corrugated fasteners, a form of special nail, are widely used in assembling frames, boxes and crates and in joining narrow widths of stock to make a wide piece. Fig. 18 shows three typical examples of the

STEEL-WIRE GAUGE

FRACTIONS (in.)	DECIMAL SIZES (in.)	STEEL-WIRE GAUGE NO.	GAUGE
	.2830	1	●
$\frac{3}{16}$.28125		
	.2625	2	●
$\frac{1}{4}$.250		
	.2437	3	●
	.2253	4	●
$\frac{5}{16}$.21875		
	.2070	5	●
	.1920	6	●
$\frac{3}{8}$.1875		
	.1770	7	●
	.1620	8	●
$\frac{5}{8}$.15625		
	.1483	9	●
	.1350	10	●
$\frac{1}{2}$.1250		
	.1205	11	●
	.1055	12	●
$\frac{3}{4}$.09375		
	.0915	13	●
	.0800	14	●
	.0720	15	●
$\frac{7}{8}$.0625	16	●
	.0540	17	●
	.0475	18	●
	.0410	19	●
	.0348	20	●

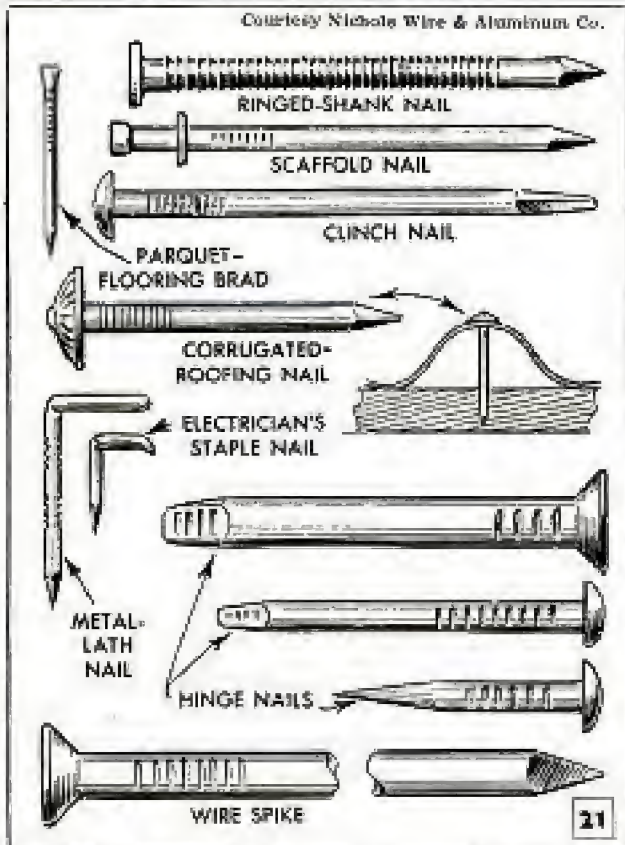
AMERICAN STEEL & WIRE CO.
STEEL-WIRE-GAUGE NO.




use of corrugated fasteners. A somewhat stronger joint will result if the parts are drawn together with clamps before nailing with the fasteners. Corrugated fasteners come in various widths and lengths which adapt them to a wide range of use on stock of different thicknesses. When joining narrow widths of stock edge to edge it usually is best to drive the fasteners in from both sides, spacing them uniformly along the full length of the joint, as in the lower detail in Fig. 22.

Other special nails are shown in Fig. 20, 21 and 22. Aluminum nails, Fig. 20, are widely used for attaching siding as they do not corrode. The ringed-shank nail, Fig. 21, has been designed for use where unusual holding power is required. The rings on the shanks are beveled at a 45-deg. angle, on the sides facing the point, so that they spread the wood fibers without severing them. The other sides of the rings are at a 90-deg. angle to engage the fibers which tend to resume their original position. This makes it necessary to break most of the fibers in order to remove the nail. Scaffold nails have two heads, Fig. 21, and are driven in up to the lower head. In this position the upper head projects, making the nail easy to remove with a claw hammer. Such nails are used for temporary construction, scaffolding and any other type of assembly which must be built so that it can be dismantled without damage. Clinch nails, Fig. 21, have duck-bill points especially designed for easy clinching. Parquet-


Courtesy Nichols Wire & Aluminum Co.



TYPE & PURPOSE	PENNY SIZE (d)	NAIL SIZES															
		2	3	4	5	6	7	8	9	10	12	16	20	30	40	50	60
	LENGTH (in.)	1	1 1/4	1 3/4	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	4	4 1/2	5	5 1/2	6
	GAUGE	15	14	12 1/2	12 1/2	11 1/2	11 1/2	10 3/4	10 3/4	9	9	8	6	5	4	3	2
COMMON NAILS: For most rough work like framing	HEAD DIA. (in.)	11/64	13/64	3/4	3/4	17/64	17/64	9/32	9/32	5/16	5/16	11/32	13/32	7/16	15/32	1/2	17/32
	NO. PER LB.	847	543	294	254	167	150	101	92	66	61	47	29	22	17	13	10
BOX NAILS: Smooth or barbed; for boxes, crates, etc.	GAUGE		14 1/2	14	14	12 3/4	12 3/4	11 1/2		10 1/2		10	9				
	HEAD DIA. (in.)		7/32	7/32	7/32	17/64	17/64	19/64		5/16		11/32	3/4				
	NO. PER LB.		588	453	389	225	200	136		90		69	50				
CASING NAILS: For cabinet work, interior trim, etc.	GAUGE			14		12 3/4		11 1/2		10 1/2		10					
	HEAD DIA. (in.)			11		9 1/2		8 1/2		7 1/2		7					
	NO. PER LB.			489		244		147		96		73					
FINISHING NAILS: For finer work than casing nails	GAUGE		15 1/2	15		13		12 1/2		11 1/2							
	HEAD DIA. (in.)		12 1/2	12		10		9 1/2		8 1/2							
	NO. PER LB.		890	630		288		196		124							




A




B


FLOORING BRADS
 (A) 20 ga., 3d, plain or barbed. Head dia. 7 ga. 105 per lb.
 (B) 1 1/2 ga., 8d, plain or barbed. Head dia. 3 ga. 142 per lb. Easier driving in hardwood without splitting.




INSULATION SHEATHING
 Galv. and barbed. Lengths, 1 1/2 and 2 in. 11 ga. 7/16-in. head. 135 and 136 per lb. Use 1 1/2-in. length for gypsum sheathing.




INSULATION LATH
 Strued, 1 1/2 and 1 3/4-in. lengths, 13 ga. 3/4-in. heads. 499, 394 per lb. For gypsum lath use 1 1/2-in. length.




BARBED ASPBESTOS-SHINGLE NAILS
 Lengths 1 1/2, 1 3/4, 1 3/8 and 2 in. 241, 210, 181 and 162 per lb. 1 1/2 ga. 13/32-in. heads without fins.




RED-CEDAR SHINGLES
 3 or 4d for new roofs. 634 or 473 per lb. 5 or 4d for shingles over old roofs. 484 or 378 per lb. Head dia. 7/32 in. 3 or 4d for 18 or 18-1/2, shingles. 4 or 4d for 23-in. shingles. Gauges 14 1/2, 14, 14 or 13 for 3, 4, 5 and 6d sizes.




WOOD-SIDING NAILS
 Range from 5 to 10d and from 14 to 16 1/2 ga.




ASPHALT-ROOFING NAILS
 Galv., smooth or barbed. Lengths, 1, 1 1/2, 1 3/4, 1 3/8 and 2 in. Gauges, 11, 11 and 10. Head dia. from 9/32 to 1/2 in. Some checkered.



STANDARD SHINGLE NAILS
 From 1 1/2 to 1 3/4 in. in length. 14 to 12 ga. 371 to 424 per lb., depending on size. Use 1 3/4-in. for wood shingles laid over old shingles or roofing. Have regular or blunt diamond point.



HARDBOARD AND BUILDING-BOARD NAILS
 7 lengths from 1 to 1 1/2 in. by 1/4-in. steps. 17 ga. 3/32-in. head. Needle point. Bright galv. or cadmium plated. 633 to 1545 per lb., depending on size.



GYPSUM WALLBOARD
 Cement coated. Lengths, 1 1/2, 1 3/4, and 1 3/8 in. 14, 13 1/2 and 13 ga. 7/32, 15/64 and 3/4-in. heads. 423, 386 and 378 per lb.

SMALL WIRE BRADS:

Length (in.)	Gauges	Length (in.)	Gauges
3/16	20-24	3/8	13-22
1/4	18-24	1/2	13-21
5/16	18-24	5/8	13-20
3/8	14-23	1 & 1/8	13-20

Larger sizes also available, including brand-head nails from 2 to 60d with same shank size as common nails.

UPHOLSTERER'S TACKS

No.	Length (in.)	No.	Length (in.)
2	1 1/2	10	3/8
2 1/2	5/16	12	11/16
3	3/8	14	1/2
4	7/16	16	13/16
5	1/2	18	3/4
6	9/16	22	1

(Carpet tacks usually come Nos. 3, 4, 5 and 10).

flooring brads come both plain and coated, the latter having somewhat greater holding power. Leakproof nails are used for attaching corrugated roofing. Only one of several types is shown in Fig. 21. Electrician's staple nails and metal lath nails are similar but are used for different purposes. The electrician's nail is used to hold runs of insulated wire in temporary installations. As its name implies, the metal-lath nail is used exclusively for attaching metal lath in building construction, as the nail is especially made for this one purpose. The chisel-pointed hinge nails, Fig. 21, are available in sizes ranging from 4d to 20d. The heads come countersunk and also oval shaped, as indicated in the details. Boat nails, Fig. 22, come both round and square, the square nails being available in lengths up to 15 in. Both come heavy galvanized and also in solid copper, which is

expensive but noncorrosive, a definite advantage in boat construction.

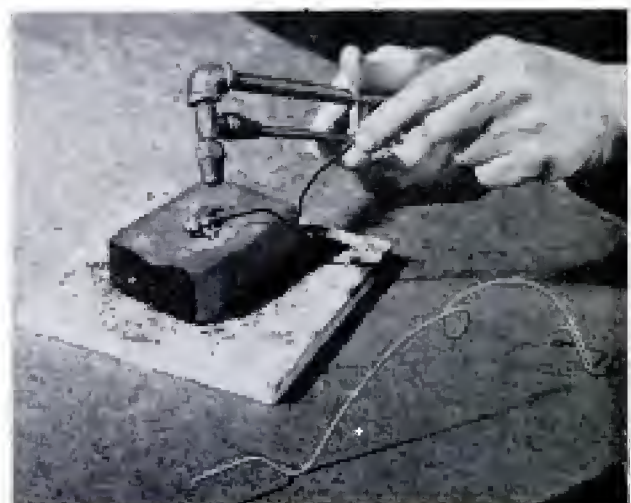
Pulling nails: Hammers come with curved claws and straight, or ripping, claws. The ripping hammer has straight claws and is designed for removing siding and sheathing. The straight claws can be driven behind the boards to start the nails. However, the ripping hammer is not so suitable for pulling nails as is the hammer with curved claws. When necessary to remove a number of nails, make a wedge-shaped fulcrum block to use under the hammer head, as in Fig. 19. By using the block, the nail will be lifted straight upward without bending. The handle stroke can be made from A to B without undue strain on either the handle or the head of the hammer. Move the block farther under the hammer head after each stroke to gain advantage of greater height. ★ ★ ★

Soldering Aid Formed From Sharpened Length of Coat-Hanger Wire

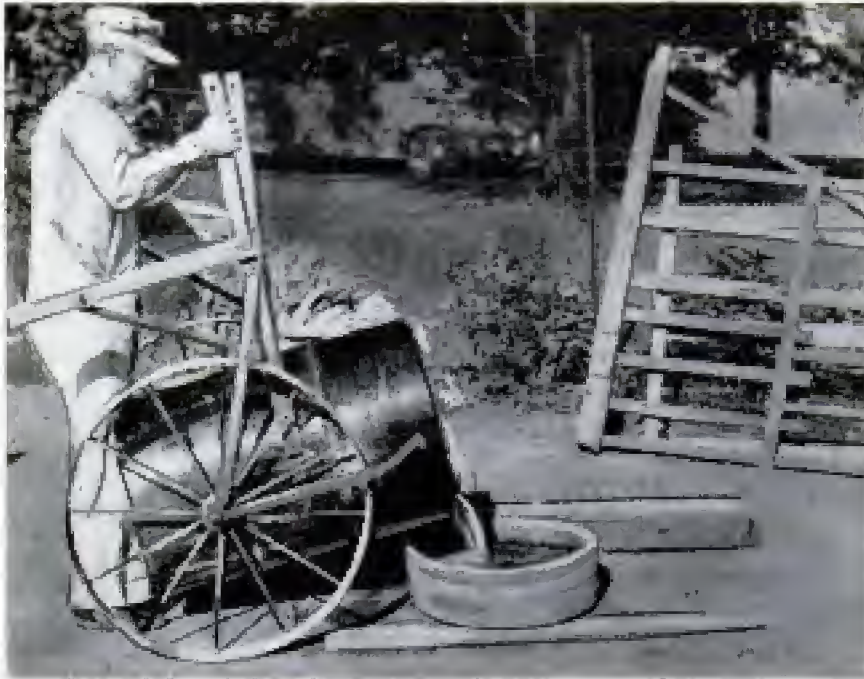
The sharpened end of a length of coat-hanger wire, heated in the torch flame, will pick up a ball of solder and permit it to be placed accurately on a joint to be soldered. The wire is shaped as shown in the photograph, the end opposite the point being bent to form a foot. A loop is formed in the middle of the wire to provide a thumb rest.—Hugh Botts, New York City.

Milk Cartons Bleach Celery

To bleach celery plants in my garden, I remove the tops and bottoms from cardboard milk cartons and slip them over the plants. This method also keeps the stalks clean.—Milton Giese, Lomira, Wis.



Oil Drum Mounted on Barrel Cart Serves as Poultry Waterer



Mounted on an improvised barrel cart so it can be pushed into the poultry yard, this 50-gal. oil drum makes the job of watering a large flock of poultry much easier. Cultivator wheels, 36 in. in dia., turn on stub axles which are bolted or welded to the sides of the drum. Flat-steel braces are bolted to the outer ends of the axles and to the drum and handles as pictured. It empties with little difficulty when the handles are raised. A counterbalance in the bottom will prevent it from tipping too quickly. — A. E. Holden, Angola, Ind.

Vacuum-Cleaner Attachment Screened When Used in Home Workshop

Using a vacuum cleaner to clean the shop is a quick and convenient method, but it usually is tough on the cleaner. A piece of $\frac{1}{4}$ -in. wire mesh fitted over the openings of the attachments will prevent large shavings, sticks and other debris from clogging the hose. Screws, nails and other small but heavy objects also will be stopped. The wire mesh is cut larger than the opening, then bent and sprung to fit so that it can be removed easily.

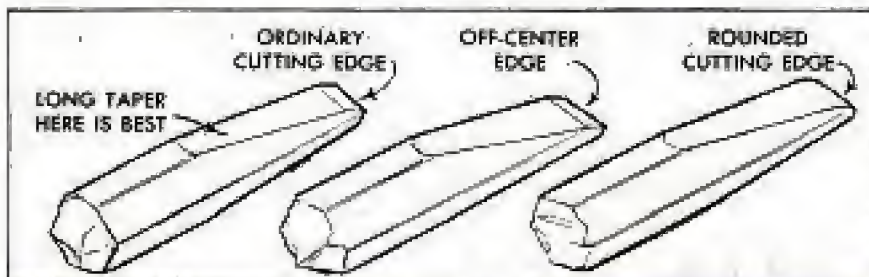


Properly Shaped Cold Chisel Required for Efficient Cutting

To do the most efficient job of cutting, a cold chisel should be drawn out to a long taper and both sides of the cutting edge should be of the same width. An off-center edge is used only when cutting off bolt or

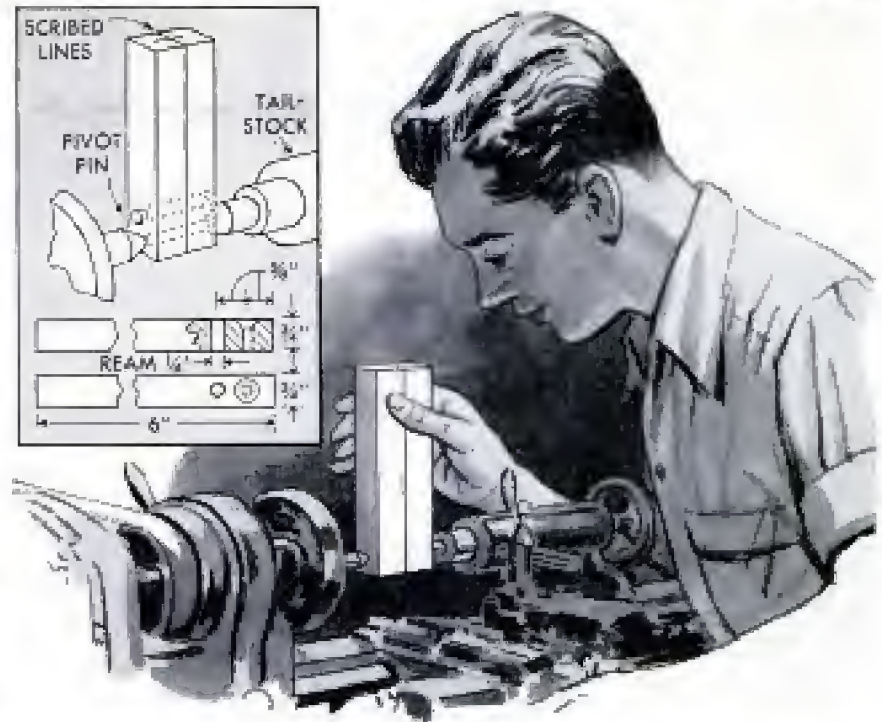
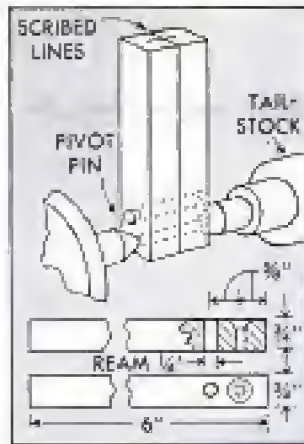
rivet heads. To aid in dissipating heat and shock, the cutting edge should be slightly rounded when doing heavy work. Also, it is advisable to use a mechanical aid to hold the chisel on some jobs. One method, using

a pair of pliers held with a strong rubber band, is shown in the photo. Holding the chisel with the palm of the hand upwards will prevent smashed knuckles. The soft part of the hand will absorb much more punishment without physical damage. The striking surface of all cold chisels should be free of ragged and projecting bits of steel that might fly off when struck with a hammer and injure the worker. — Glen F. Stillwell, Manhattan Beach, Calif.



"Pivot Gauge" Sets Lateral Alignment Between Lathe Centers

Accurate lateral alignment between lathe centers is assured by the use of a "pivot gauge" made from two 6-in. lengths of $\frac{5}{8}$ -in.-sq. cold-rolled steel. The dimensions of the gauge are shown in the detail. The steel blocks must be clamped together and accurately drilled and reamed for the $\frac{1}{4}$ -in. pivot pin. The holes at the lower end of the gauge are drilled with a 60-deg. center drill to receive the lathe centers. After the gauge is drilled and assembled, and before the alignment marks are scribed, use a test bar to set up the lathe centers. When the indicator gauge shows zero for the full length of the test bar, remove the bar, install the pivot gauge and scribe a mark across the top of both blocks. The gauge then can be used to set the lateral alignment



between lathe centers by moving the tailstock until the scribed lines meet exactly when the gauge blocks are held upright.
C. W. Woodson, Chicago.

Numerals on Metal Rule or Square Can Be Renewed With Paint

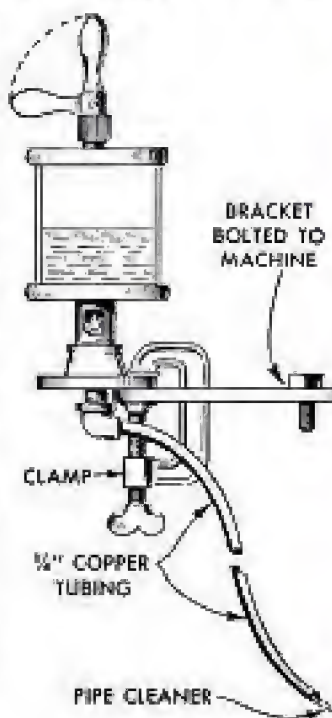
If the numerals and markings on a square or metal rule have become difficult to read, clean the tool with steel wool and apply a coat of bronze or black paint. Then wipe off the excess paint. This will leave paint

only in the depressed numerals and lines. Use bronze or light-colored paint on tools painted black, while black paint will be most visible on polished metals.

Clinton R. Hull, Costa Mesa, Calif.

Drip-Type Oiler Adapted to Lubricated Drill-Press Work

A drip-type oiler can be adapted to provide a steady flow of lubricant to light work on a drill press or lathe. The oiler is screwed into a pipe flange, which provides a means of clamping it to a bracket bolted to the machine. A short pipe nipple is screwed or brazed to the lower end of the flange and fitted to receive a length of copper tubing. The tubing then is shaped to feed oil to the drill or work. A pipe cleaner in the end of the tubing prevents an excessive flow of oil, and can be held directly against the turning work in a lathe or drill bit in a drill press. — Hi Sibley, Nuevo, Calif.



SHOPPING FOR TOOLS



1. FLAT-LAPPING MACHINE is designed for precision finishing of parts having flat surfaces. The lapping plate is 24 in. in dia. and is spirally grooved to carry the abrasive. Nearly all flat-lapping operations on small parts can be carried out with the work hand-held as pictured without the use of special holders or collets. Machine requires space only 25 x 25 in.

2. MODELMAKER'S HAND PLANE utilizes an ordinary double-edged safety razor blade. Lifts paper-thin shavings when used on either hard or softwood. Just the thing for shaping model parts of balsa or other extremely soft woods which require very sharp cutting tools for accurate work. Plane also is useful for fitting cabinet doors, drawers and moldings

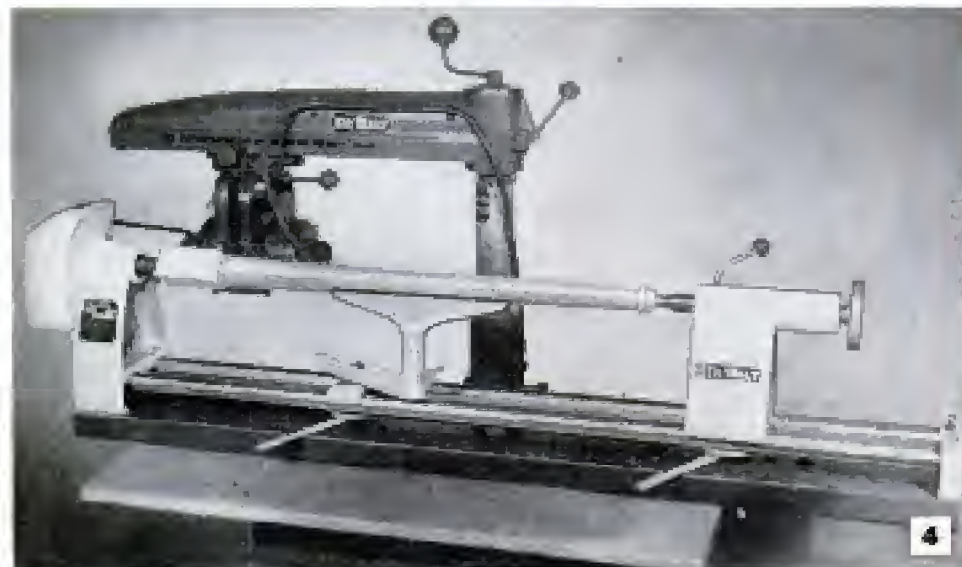


3. PRESSURE-GRIP WRENCH, or ply wrench, has a pivoted jaw that automatically adjusts from $\frac{1}{8}$ to $1\frac{1}{2}$ in. Suitable for use on pipe, tubing, solid rounds, hex shapes and conventional nuts. User simply drops the wrench over the part to be held or turned and the jaws adjust as pressure is applied to the wrench handle. Special design of the jaw teeth minimizes slippage

4. WOOD-LATHE ATTACHMENT for radial saw has a 12-in. swing and takes stock up to 37 in. in length between centers. Unit mounts on the radial-saw table and is driven by saw motor as pictured. Can also be set up and driven as an independent machine by any separate motor when desired. Comes complete with accessories for faceplate turning and metal spinning



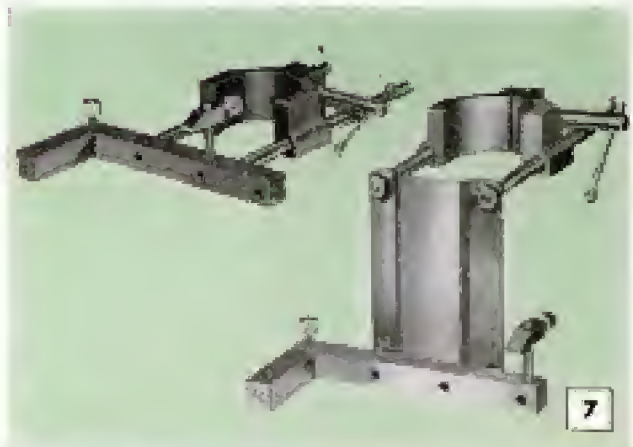
5. NEW SIDE-CUTTING PLIERS come fitted with a special throat piece which grips cut end of wire and prevents it from dropping onto "live" electrical assemblies and causing a short circuit. Also prevents short pieces of wire from flying sidewise and causing possible eye injury to others working near by. Holder is available on both diagonal and straight pliers



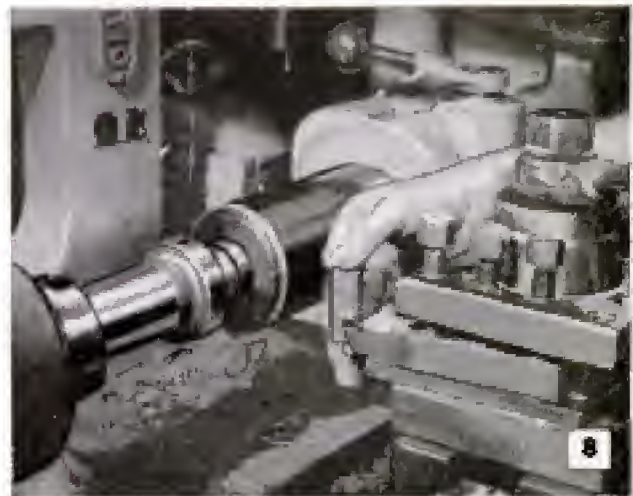
6. GRINDING ATTACHMENT traverses automatically right and left and also feeds automatically into wheel at an adjustable rate. This permits grinding bevels on edge tools at any desired angle without danger of overheating and drawing temper. Tool carriage is designed to prevent any tendency to chattering as tool traverses face of wheel. Traverse is full 3 in.



7. WORK GUIDE clamps to the column of a small drill press and is used to hold or position work without the use of C-clamps or other types of hold-downs. Consists of the clamping device and a machined right-angle piece which is adjustable in or out and also laterally across the machine table. Available with an extension piece as pictured in the right-hand view



8. HAND HONE for touching up cutting edges of carbide tools extends between-grinds tool life as much as 30 percent. Single-point carbide tools are honed without removing from the machine. With care, tools can be hand-honed several times before relief angles are changed sufficiently to make regrinding necessary. Available in several sizes and also in different grades



9. LEVELING ATTACHMENT for portable electric drills enables the operator to drill accurate holes at any angle. Consists of a circular bubble level mounted on a bracket having graduations from 0 to 90 deg. Bracket is attached to body of portable drill and locked at the angle desired. Operator starts drill and holds it so that bubble remains in center of viewer

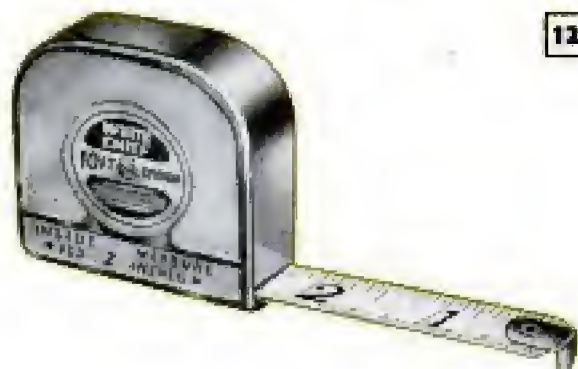
10. DOUBLE TORCH has been especially designed for sweating joints in copper tubing, copper piping and copper soil stacks. Torch consists of two "jaws" which encircle the joint when closed by hand pressure. Each jaw is fitted with three flame jets. When both are closed by hand pressure the six jets heat the joint uniformly. Two sizes take tubing from 3/8 to 4 in.





11

11. SANDER-POLISHER duplicates natural hand motion in either sanding or polishing operations. Leaves no swirl marks on the work due to counterbalancing action of two floating heads when polishing or sanding. This eliminates "throwing," a common problem when finishing surfaces with high-speed rotary polishers having only a single disk. Eliminates handwork



12

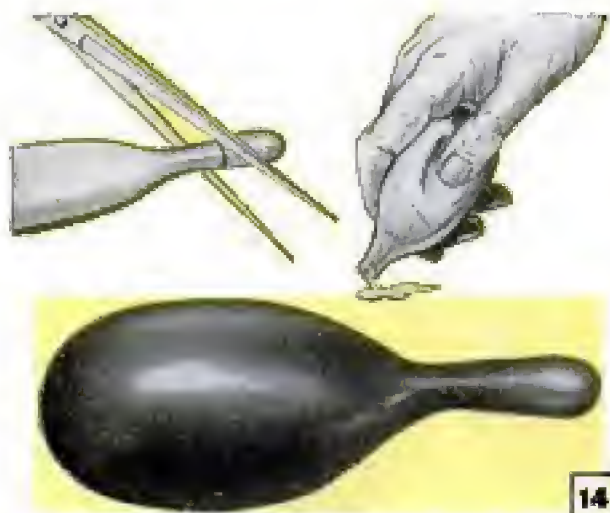
12. RIGHT-HAND RULE is designed for convenience when measuring from right to left and laying off dimensions with pencil or scriber held in right hand. In this position the figures and graduations are right side up on the white blade. Chrome-plated case is precisely 2 in. wide. This distance is added to all in-between measurements. Steel blade is full 10 ft. long



13

13. RADIANT KEYHOLE SLEEVE glows in the dark, making it easy to insert key in the lock in total darkness. Can be attached to practically all types of cylinder locks, including auto-door locks, residential and office locks of the common types. One-piece insert in the right-hand view is shown in place on the lock cylinder in the left-hand view with key in position

14. SPECIAL HOUSEHOLD GLUE in a plastic applicator is now available. Adhesive joins porcelain, wood, fabric, plastic or thin metals. To use, the extended tip of the plastic capsule is snipped off and the container becomes an applicator. Any glue remaining in the applicator quickly sets and seals the small opening in the tip. Glue remains fresh indefinitely



14

15. IMPROVED DOVETAIL JIG for use with electric router produces perfectly matched dovetail joints in drawers and cabinet parts. Cuts the pins and sockets on both parts simultaneously. Takes stock up to 12 in. wide and 5/16 to 1 in. thick. Router is guided by a finger template which is available in two sizes for making dovetails 1/4 or 1/2 in. wide



15

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SURE SIGNS OF SAVINGS





Normal photograph



Taken with red (A) filter

How Kodak Wratten Filters give your snapshots true-to-life sparkle

**Designed to assure "high-fidelity" results,
they are the world's standard for photographers,
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THE HIGH FIDELITY you read about in musical reproduction is arrived at by electronic filters. In somewhat the same way, photographic filters assure true-to-life realism and sparkle in your snapshots.

They act upon the colors of a scene in such a way that, in a black-and-white snapshot, these colors assume the relative brightnesses seen by the human eye. In this way, white clouds are made to stand out in fleecy grandeur. Green foliage becomes sharply real and well defined. Close-ups of

human subjects are thrillingly lifelike.

This "high fidelity" given to your snapshots by Kodak Wratten Filters is one of the most enjoyable discoveries you can make in photography.

For nearly half a century Kodak Wratten Filters have been the world's standard of accuracy and precision not only in photography but in many other areas of science and engineering. Such universal acceptance is due to the way these filters are made. (See picture story on next page.)

How Kodak Wratten Filters are made



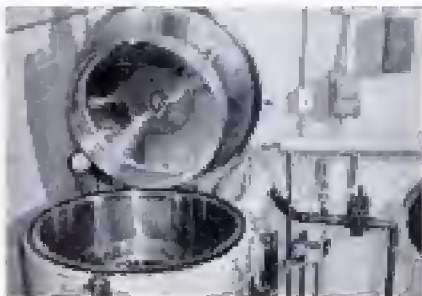
Highest quality dyes. Kodak uses hundreds of different filter dyes, specially selected for purity and brightness, and carefully blended for precise color quality required for each filter.



Meticulously filtered. After the dyes are blended according to strict formula, they are filtered and refiltered to obtain the optical quality specified by the Kodak Research Laboratories.



Dyes are color-matched. Each dye solution must match a color standard. A special instrument—a spectrophotometer of unusual design—controls the color of the filters.



Gelatin is "clarified." In this machine specially selected, color-free gelatin is given high clarity by centrifuging it under vacuum to remove possible foreign particles.



Dyes mixed with gelatin. The carefully standardized dye solutions are accurately metered into the liquid gelatin. The resulting crystal-clear mixture is again filtered.



Coating on glass. The dyed gelatin solution is uniformly coated on ground and polished glass sheets and then dried. Here coated sheets are being removed from the dryer.



Conditioned for two weeks. The dried gelatin coating is removed from the glass and conditioned for two weeks in special racks. It is then inspected for color and physical quality.



Glass cut, polished like fine lens. For protection and ease in handling, Wratten Filters are mounted between ground and polished glass. Unmounted filters for laboratory use are lacquered.



Cemented for permanence. A continuous layer of cement permanently bonds filter, glass and metal protecting ring into a single unit—like your camera lens.

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Care and Feeding of Engines



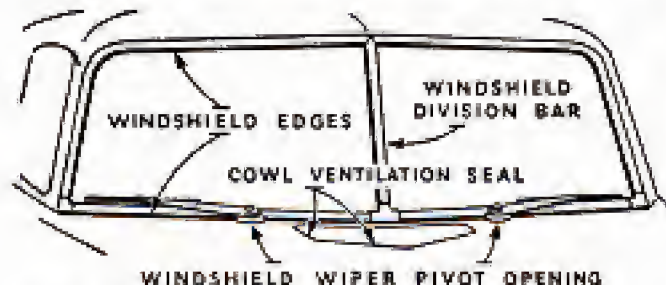
BY
S. P. CORP

WINDSHIELD WATER LEAKS

If heavy rain leaks in around your windshield, it means that the edges of the windshield need to be resealed in the following manner:

WINDSHIELD SEALING

Remove center division bar by taking screws out from inside. If leaks occur at center of instrument panel, center bar may not have been tightened correctly. Loosen, but do not remove, garnish molding around inside of windshield. Remove windshield wiper arms and stainless steel molding from the outside of the windshield, using care in working it away from glass.



Now seal weatherstrip against the body opening by lifting the rubber and applying a good grade of windshield sealer. Use a nozzle-type applicator so as to force the sealing compound up and around the body edge where the rubber fits up over the edge. It is not required to seal between glass and rubber unless glass has been replaced. In such a case, remove inside garnish molding and apply sealer between glass and weatherstrip. Seal the windshield all along the bottom and for a short distance up the sides. Wipe off excess sealer and replace moldings, drawing them up so the rubber is slightly compressed. Use a cleaning fluid to remove excess sealing compound.

FREE HELP ON CAR CARE

When it's time to re-ring your engine, be sure to use a Sealed Power KromeX Ring Set, with solid chrome faces on top compression ring and rails of steel oil ring. These rings are factory sealed for fast break-in and immediate oil control, and their chrome faces fight heat, friction, abrasion and corrosion—the enemies of ring life. For your free copy of the illustrated manual, "MORE POWER, Less Gas, Less Oil," simply address a postal card to Dept. G-7, Sealed Power, Muskegon, Michigan.



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PISTON RINGS

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Flat Roof or Gable?



Q—*I'm ready to build a new home but can't decide on whether to select a style having a flat roof or a conventional low-pitch gable roof. I like the flat-roof homes but am told these are not practical, that is, from the standpoint of durability. What are some of the advantages of both types? Will flat-roofed homes become "dated"? — B.W., Pa.*

A—We'd suggest that you consider the compromise between the two, the so-called shed roof. Many homes both large and small are now being built with variations of this type of roof. We see no reason why this type of home could not be made as attractive and practical as those of more conventional styling. All existing homes are dated whenever there are marked changes in architectural design. This should not be a reason for sacrificing the type you like for something less desirable. Properly designed and built there is no reason why a flat-roofed home should not give good service. In some localities a flat roof will accumulate heavy loads of snow and ice under certain weather conditions during the winter months. This can cause damage to a flat roof improperly constructed, of course. On an average, the flat-roofed home is somewhat cheaper to build because of less labor involved. However, at least a part of this saving will be offset by increased cost of the necessary materials. In more conventional homes of the ranch type with low-pitched roofs the roofing materials are subjected to somewhat less "wear."

Paint Defects

Q—*What causes checking, blistering and wrinkling of paint when applied to wooden siding? — A.J., Minn.*

A—Checking generally means short, narrow breaks in the paint film. As a rule both checks and cracks (longer and larger cracks) are the result of shrinking and hardening of the paint film so that it no longer has sufficient elasticity to resist atmospheric changes. Moisture penetrating the walls from the room side is a common cause of blistering paint. Moisture in the form of vapor will penetrate all common building materials except barriers, and eventually will collect under the paint film. Moisture in the form of excess humidity may have as its source steam from the preparation of food in the kitchen, laundering and shower bathing. In new homes slow drying of plaster is a cause of paint blistering on exterior walls. A common cause of wrinkling is the application of a

(Continued to page 210)

No wonder it's called
"Miracle Vinyl-Flooring"!



MATICO ARISTOFLEX

RESISTS GREASE, ACID, ALKALI AND GRIME!

You'll call it "miracle flooring," too, when you see for yourself how rugged, durable MATICO Aristoflex shrugs off household acid, alkali and grease... stays new and sparkling looking with easy damp moppings. Biggest miracle of all is the price! Produced especially to meet the needs of homeowners everywhere, MATICO

Aristoflex is low in cost... gives you more for your money. And you can install economical Aristoflex in every room in your home... from basement to attic. See Aristoflex in 12 rich, clear colors at your MATICO dealer soon. You'll find him listed in your classified telephone directory.



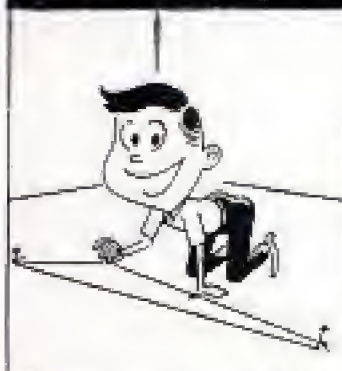
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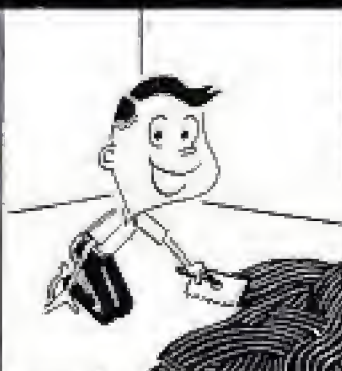
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INSTALL IT YOURSELF AND SAVE!



It's easy! Just mark a straight line through the center of your room in both directions, using a chalk and line. Be careful not to cover up your guide lines.



With a notched trowel, spread adhesive over one-half of your room at a time. Leave only a thin coat of adhesive on the floor.



After adhesive becomes tacky, snap the tiles into place. Do not slide tiles or adhesive will push up between the tiles.



Here's the best part! Show your wife your handiwork. (Don't tell her what a cinch it is with MATICO's easy-to-follow instructions).

DO-IT-YOURSELF PROJECT WITH TRIPLE PAY-OFF



In making his own house sign (for example), this man is (1) saving money, (2) adding to the value of his home, and (3) having a lot of fun doing it.

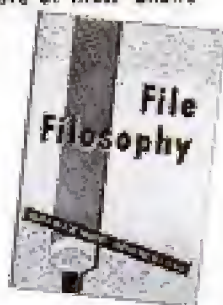
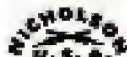
What's more, his pride of achievement is heightened by his possession and use of good files. They're NICHOLSON. This and BLACK DIAMOND are the most famous two brands in the world.

He knows their teeth are sharp, evenly high, of uniform hardness, and have extra-long life. They're the choice of both the professional and the exacting amateur craftsman. They've the quality good hardware and tool-supply dealers like to recommend.

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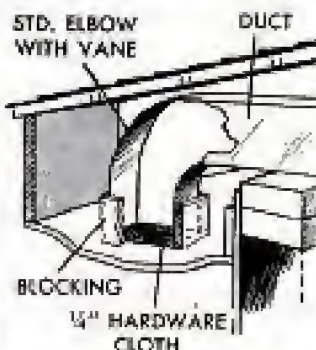
(Continued from page 208)

heavy finish coat over undercoats which are not thoroughly dry. It should be understood that only the more common causes of paint defects are given above. There are, of course, other causes. In some cases application of a heavy primer to dry, soft woods causes absorption of the oils in the paint before these have a chance to set properly. This can cause peeling.

Moisture Condensation

Q—Can you explain how and why moisture condenses in the walls of buildings and also how it came to be a serious problem in ordinary house construction?—C.E., Ind.

A—Space does not permit an extended discussion of this problem, but perhaps a basic cause of wall condensation can be outlined briefly. Because of what is known as vapor pressure, air containing moisture escapes through the walls and ceilings of the house when the outside temperature is lower than that inside the building. At the same time, heat loss through an uninsulated wall tends to prevent a lowering of the temperature within the wall to the condensation point. For this reason, such walls remain comparatively dry. Some years ago, when house walls were insulated with sawdust and other fine materials, the insulating properties of these materials greatly retarded, but did not entirely prevent, the passage of heated, moisture-laden air through the walls and ceilings. This slowing up of the process of air and heat transfer usually resulted in a gradual lowering of the temperature within the walls to a point where the water vapor in the air condensed, generally on the inner surface of the sheathing boards. At this point, the beads of moisture formed frost if the temperature was sufficiently low, or penetrated the sheathing and siding to the paint film if the temperature at the inner surface of the boards was above the point where frost would be formed or condensation take place. This penetration of moisture through the boards from the back is a cause of peeling paint, rotted framing and a general condition of dampness throughout the whole structure. Manufacturers of insulating materials in various forms have developed vapor barriers which are installed along with the insulation in the form of moisture-resistant covers, or "envelopes," for the insulating material itself, and also in separate sheet forms which are tacked over the studding under the plaster. These barriers are fully effective only if they are installed in accordance with the manufacturer's instructions.



Kitchen Fan Vent

Q—I want to install a kitchen ventilating fan in my new home which has wide overhanging cornices. I have planned to carry the exhaust duct from the fan into the attic space, but how to vent the fan from there is my problem. Should the fan be vented through the wall or is there some way to vent it through the attic?—A. T., Tenn.

A—It should be comparatively simple to run the vent into the attic and across the floor to the plate and out through a down-turned elbow as detailed in the accompanying sketch. Usually there is sufficient room between the top of the plate and the underside of the roof boards for a small duct placed either edgewise or flat. You may have to have a special elbow made by a local tinsmith to fit the space available. Cut an opening the exact size of the elbow opening in the bottom of the cornice, or soffit, add blocking to hold the end of the elbow in place. Then cover the opening with fine-mesh screen to keep out birds and insects. In some locations and under certain weather conditions this type of installation may permit cold air to filter back through the vent into the kitchen. Because of this possibility it's a good idea to install a turn damper or shut-off vane in the duct in such a way that it can be operated from some convenient location by means of pull chains or a lever.

MAKE YOUR OWN PORCH and PLAY-YARD EQUIPMENT

for Outdoor Living this Summer!

It's Easy and Simple to do with Amazing

REYNOLDS *DO-IT-YOURSELF** ALUMINUM



SAND BOX with Reflective Sun Shade provides happy hours for youngsters, protects them from hot sun. Shade adjusts to any height, lowers to serve as cover. Rust-proof, so easy to clean. Plan #112, 25c with coupon.



FOLDING TABLE. Ideal for cards, informal eating, serving, base for portable grills . . . indoors or outdoors. It's all aluminum . . . stays bright and new-looking, won't ever rust. Reynolds Plan #110, 25c with coupon.



HANDSOME PICNIC HAMPER is a picnic to make with Reynolds *Do-It-Yourself* Aluminum. Sturdy, lightweight, plenty of room for food and picnic equipment. Reynolds Plan #111, 25c with coupon.

It's no trick at all to make things with amazing Reynolds *Do-It-Yourself* Aluminum. All you do is follow any of our simple plans (see coupon below) . . . and make things that would do credit to a professional craftsman.

Easier to Work than Wood . . . this fabulous material is specially engineered for use with *standard* woodworking hand or power tools. You can saw it, drill it, plane it, joint it, just like you do wood. And think of the other advantages: Reynolds *Do-It-Yourself* Aluminum is bright and beautiful, it's strong and sturdy, and it will never rust . . . perfect for outdoor use as well as indoors. Mail the coupon for the simple Reynolds Plans today.

CAUTION: Use only Reynolds *Do-It-Yourself* Aluminum . . . ordinary aluminum may harm tools. Look for special Seal (shown on coupon) attached to each piece.



SMART PORTABLE SERVING CART . . . a marvelous convenience indoors and outdoors. Light, functional and rustproof. It's a simple job with this fabulous Aluminum. Reynolds Plan #114, 25c with coupon.

*7. M. Reynolds Metals Company

SEND FOR THESE EASY PLANS TODAY!



REYNOLDS SALES COMPANY
2494 South Third Street, Louisville, Kentucky

Please send me Reynolds *Do-It-Yourself* Aluminum Plans as checked below. I enclose 25c in cash or money order for each Plan ordered.

- Reynolds Plan #112 for SAND BOX . . . 25c
- Reynolds Plan #110 for FOLDING TABLE . . . 25c
- Reynolds Plan #111 for PICNIC HAMPER . . . 25c
- Reynolds Plan #114 for SERVING CART . . . 25c
- How-to Booklet containing general instructions and suggested projects **FREE**

Name

Address

City Zone State

Reynolds *Do-It-Yourself* Aluminum is available in Canada



**Your Lumber and
Building Material
Dealer**



**One best
one stop
source.....**

**FOR ALL
HOME-OWNER
AND HOBBY-CRAFT NEEDS**

Buy your "do-it-yourself" requirements where the professional builder buys—at your neighborhood Lumber & Building Material dealer's.

You'll find him a one-stop source for the best in power and hand tools... cabinets, plywood, paints, hardware, wallboard and floor coverings... all kinds of lumber and building materials—all of professional quality...and in price ranges to fit your budget.

There are more than 20,000 Lumber & Building Material dealers from Coast to Coast—in big city and small town, stocked and equipped to serve and advise you as capably as they serve the nation's professional builders.

Buy your "do-it-yourself" hand hobby-craft requirements from your neighborhood Lumber & Building Material dealer—and save.



This advertisement is sponsored by the publishers of BUILDING SUPPLY NEWS and PRACTICAL BUILDER as a service to the public.

Every Man a Forest-Fire Fighter

(Continued from page 103)

Heavier equipment is kept in strategically placed fire headquarters of the forest protective associations and state forestry departments. The proven mainstays are large pumper trucks and bulldozers for building fire lines. Some of the privately owned pumpers are the envy of a city fire department and fairly similar. One of the most popular is a model built in California on a Ford F-8 truck chassis. It carries 1000 gallons of water and a high-pressure fog-spray pumping system that will handle two high-pressure hoses or three low-pressure forestry lines. These pumpers will draw from their own tanks or from a water hole, as do the lighter patrol trucks. Also used on some tree farms are huge tank trailers, carrying up to 8000 gallons and pump equipment. They are drawn by bulldozers.

Other fire protection goes on the year 'round. Water holes and storage ponds in mountain streams are developed alongside the fire roads for the pumpers. Slash is an all-season fight—getting rid of the tinder-like treetops and other debris of logging.

Civic groups have been doing their part in this enlarged battle against fire. The Keep America Green program, sponsored by the forest industries, has done a grand job. You will probably see Keep Washington Green or Keep Virginia Green signs along the highways, as the program is organized by states. Youth groups, too, have been active. In Oregon, 25,000 boys and girls are organized in the Green Guard; they learn how to report fires, how to prevent them and what to do at a fire. Indiana has its young Forest Fire Fighters, Minnesota its Forest Rangers Clubs and many other states have similar youth organizations that do effective fire-prevention work.

Because all these civilians are working hard, the forest fires of our nation have been reduced to the point today where they destroy only one-third as much standing timber as do insects. But it is still a real fight because fire still destroys the greatest number of trees. It burns tomorrow's crop—the young trees, the seedlings and the cones on the ground. The expanded army still needs your help this coming season. Careless smokers, people who toss away lighted cigarettes, are starting about a fourth of the forest fires today. Fire bugs, those few who deliberately start forest fires, cause as many more. Thoughtless campers who fail to make sure their campfires are out and summer lightning storms are other principal causes. You can't help the lightning but don't be one of the other three. ★ ★ ★

For greater driving safety, one control now operates MoPar windshield washers and wipers



MOPAR ISN'T JUST THE NAME OF A WINDSHIELD WASHER. It identifies thousands of parts and accessories especially designed for your Plymouth, Dodge, De Soto, or Chrysler car or Dodge truck. Drive in where you see the MoPar sign for the finest in parts and accessories.

**PARTS DIVISION • CHRYSLER CORPORATION
DETROIT 31, MICHIGAN**

JULY 1954



YOU CAN KEEP YOUR HANDS ON THE WHEEL . . . forget about fumbling for a wiper knob when you want a clean windshield. Just touch your toe on the foot button of the new MoPar "Jiffy Jet" windshield washer. Twin nozzles start to spray . . . wipers start to clean . . . *simultaneously, automatically.* Wipers will keep cleaning after spray stops until you release foot button.



STRONG SPRAY EVEN ON HILLS or when passing. That's because "Jiffy Jet" does not depend on engine vacuum like most windshield washers . . . won't dribble or stop when you accelerate. Spray pressure at the nozzles is *3 times* stronger than with most washers, too . . . blows out dirt that might clog nozzle openings otherwise.



GET THE NEW "JIFFY JET" from your nearest Plymouth, Dodge, De Soto, Chrysler dealer or wherever you see the MoPar sign. And look for the MoPar label whenever you want the *official* Chrysler Corporation parts and accessories. They are all factory engineered and inspected to *fit right, work right, last longer.*

213

Your engine's life depends on a film of oil thinner than a cigarette paper!



Press a cigarette paper between your fingers. It's thicker than the film of oil that guards your car, as it flows between high-speed moving parts.

Use high-quality Quaker State for the super film that gives longer-lasting lubrication.

IT'S A SUPER FILM! Good name for the fine film of oil that protects your car's engine from wear—the film you get from Quaker State Motor Oil. Heat-resistant, pure, free-flowing, this superb motor oil is refined from 100% Pure Pennsylvania Grade Crude Oil—nature's best. It is designed and tested for today's high-compression engines, the result of 50 years of continuous improvement. So rich, so stable, every quart lasts longer—goes farther.

ASK FOR...



Quaker State Motor Oil is made to suit the requirements of all makes of cars and for every type of service. Ask your dealer.

QUAKER STATE OIL REFINING CORPORATION, OIL CITY, PA.
Member Pennsylvania Grade Crude Oil Association

Owners Report on the 1954 Ford

(Continued from page 110)

into it and average is about 14 miles per gallon."—Muscatine, Iowa, county worker.

"Most outstanding feature is the ball-joint suspension, particularly on rough roads I travel."—Miles City, Mont., game warden.

"My only complaint is a slight bumping noise in the front-end suspension."—Cross, S. C., housewife.

"Car pulled to the right bad, but they realigned the front end. Now OK. Had one bad tire which was out of round and a wheel had a high place which was ground down. These caused car to bump."—Chattanooga, Tenn., steamfitter.

"Don't like ball-joint suspension. Not built strong enough. I hit a six-inch hole and the repairs cost me \$74."—Hot Springs, S. D., cook.

"Ball-joint suspension and new engine make it a fine road car. You've got power plus control."—Thompson, N. D., rancher.

Some Owners Complain of Engine Noise

High on the complaint list was engine noise due principally to the overhead valves.

"Tappets noisy even after 1000-mile adjustment. Not adequate insulation between engine compartment and driver. Rear end hums between 55 and 65."—Dearborn, Mich., automotive designer.

(Continued to page 216)

One owner says Ford's chrome strip (right) should be lower to protect paint in situations like this





Hack Saws Back Saws
 Mitre Saws Coping Saws
 Compass Saws Keyhole Saws
 Pruning Saws Nests of Saws
 Mechanic-Kut Circular Saws

No More Wrist Strain!

- All Atkins handsaws (and only Atkins) have the famous *Perfection Handle*—a basic design change to permit faster, easier cutting with no wrist strain!

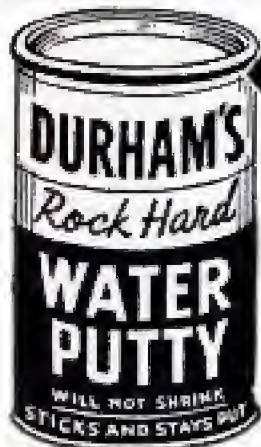
Atkins *Perfection Handle* applies cutting pressure on a straight line from the elbow, through the wrist, to the middle of the cutting edge. There's no wrist action... less fatigue... the cut runs perfectly true!

WHEN YOU BUY A SAW, BUY A GOOD ONE—ATKINS!

ATKINS

ATKINS SAW DIVISION

Borg-Warner Corporation • Indianapolis 9, Indiana



The Modern PLASTIC for lasting Home Repairs

PERMANENTLY mends cracks or holes in wood, tile, stone or plaster. Sticks and stays put—Does not chip, shrink or fall out. Easy to use. Economical. Mold it, chisel it, polish or paint it. If unobtainable from your lumber, paint or hardware dealer, the big 4-lb. can will be sent you post-paid (in U.S.) for only \$1.25. Full money-back guarantee, order now.

DONALD DURHAM CO.

Box 804-T Des Moines, Iowa

SAY YOU SAW IT IN POPULAR MECHANICS



QUALITY UNSURPASSED—
 PERFORMANCE UNEQUALLED

Yet Cost No More Than
 Ordinary Screwdrivers!

HOLD-E-ZEE

The Original AUTOMATIC GRIP
 SCREWDRIVERS

*Much Wanted
 Special Features*

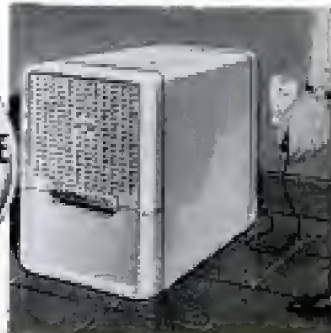
UPSON BROS., INC., ROCHESTER 14, N. Y.

EXCLUSIVE
LOK-BLOK®

Makes Blade
 Twist & Impact
 Proof

AT ALL
 LEADING
 DEALERS

DAMP BASEMENT?



Just plug in
 the amazing

FRIGIDAIRE ELECTRIC DEHUMIDIFIER

Only 18 1/4" high — 20 1/2" long — 11 3/4" wide

Positively controls moisture in linen closets, basements, storerooms, workshops, or any closed area up to 10,000 cu. ft. where moisture is a problem. Fan draws air through refrigerated coil. Moisture is condensed and collected in container. May be connected to drain. Dry, filtered air flows into room.

See your Frigidaire Dealer for further details. Or write for free folder to Frigidaire, Dept. 2247, Dayton 1, Ohio. In Canada, Toronto 13, Ontario.



Built and backed by General Motors



Now-an easy way to wash your car!

*JUST SPONGE IT ON -
RINSE IT OFF!*

FAST-ACTING, ECONOMICAL DU PONT CAR WASH

NEW DU PONT CAR WASH cleans faster and easier than you ever thought possible. Just sponge it on . . . rinse it off . . . and your car dries itself. No wiping or chamois work! Du Pont Car Wash gets off all the grease and grime . . . leaves your car spotless.



One tablespoonful washes your car. Half-pound can gives 20 washes!

DU PONT NO. 7. PRODUCTS
From Chemical Research . . . For Easier Car Care



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

"Valves too noisy. Require adjustment too often."—Minquadale, Del., mechanic.

Other complaints include poor gasoline mileage, inconvenient location of oil filter and distributor.

"Mileage on new engine is very poor. May increase but doubt it. Rear windows of Ranch Wagon all leak."—Cromwell, Conn., manager.

"Don't like gas mileage. Ash tray in wrong place. Oil filter in inconvenient location."—Santa Rita, N. M., dispatcher.

1954 FORD SPECIFICATIONS

Mainline, Customline and Crestline models

ENGINE

Type	Six	Eight
	6-cyl., OHV	8-cyl., V-type, OHV
Bore and stroke	3.82x3.80 in.	3.50x3.10 in.
Piston displacement	223 cu. in.	229 cu. in.
Brake horsepower	115 at 3900 r.p.m.	130 at 4200 r.p.m.
Compression ratio	7.2 to 1	7.2 to 1
Transmissions	3-speed conventional, Overdrive or torque converter with planetary gears optional.	

GENERAL

Steering ratio (over-all)	25.3:1
Steering wheel lock-to-lock	4.5 turns
Turning radius	20.58 ft.
Brakes	conventional hydraulic
Tire size	6.70x15
Recommended tire pressure	24 lbs. front, 23 lbs. rear
Shipping weight (4-dr. sedan)	
unladen	3174 lb.
Wheelbase	115.3 in.
Tread, front	58 in.
Tread, rear	56 in.
Height over-all (unladen)	64.1 in.
Width over-all	71.2 in.
Length over-all	198.3 in.
Road clearance	5.6 in.

CAPACITIES

Oil	4 qt.	3 qt.
Water	15 qt.	20 qt.
Gasoline	17 gal.	17 gal.

INTERIOR DIMENSIONS

Front-seat hip room	58.9 in.
Rear-seat hip room	58.9 in.
Headroom, front	35.4 in.
Headroom, rear	34.2 in.
Legroom, front	42.8 in.
Legroom, rear	41.5 in.

"Traveled 450 miles in mountains with 150 miles of it on dirt and mud roads with lot of stop-and-go driving. Gasoline mileage was 15.8 for the week. I am well satisfied."—Wellsburg, W. Va., fieldman.

"Oil filter hard to change. Cost extra to have it changed."—Kramer, N. D., soldier.

"Do not like distributor at rear of engine."—Jal, N. M., utility worker.

"Engine unhandy to work on."—Dwyer, Wyo., rancher.

Miscellaneous Complaints

"Speedometer makes too much noise."—Sioux City, Iowa, photographer.

(Continued to page 218)

HOW YOUR SHOCK ABSORBERS WORK



Without shock absorbers, your car would be as bouncy as an old spring wagon. It would be unsafe too. The modern shock absorber works on a hydraulic principle — slows down and evens out the spring action — helps keep your car from "hitting bottom." In doing this job, your shock absorbers give you a more comfortable, safer ride. They control the spring action, reduce the sway on curves where an extra inch or two of

sway may cause you to completely lose control of your car. Shock absorbers have another important job — they help keep the tires in contact with the road at all times. This provides better steering control, safety against skids and gives you better tire life. Car designers give shock absorbers a big job to do and so they need careful attention; for *they do wear out*. Shock absorbers should be checked frequently, replaced as needed.

HOW TO INSTALL SHOCK ABSORBERS

Study carefully the way your old shock absorbers were installed. Remove them carefully, loosening the top nut first. Install the new shock absorbers in the same position as the old. Be careful not to install shock absorbers upside down — the part number should be at the top. New rubber bushings should be installed whenever new shocks are put on. When tightening the nut on the top and on the bottom, be careful not to distort the shape of the rubber bushings.

When you need shock absorbers be sure to buy genuine **GOLDEN GLIDE SHOCK ABSORBERS**

These are a product of America's oldest hydraulic shock absorber manufacturer. They are stronger, better protected, long lasting. There are *Golden Glide* Shock Absorbers custom-built to do the best possible job for every make and model car. Buy them from your jobber, service station or independent repair garage. *Houdaille-Hershey Corporation, Buffalo 11, New York.*



This is a view of a typical rear end shock absorber installation. At the top of advertisement on the right, you will see a typical front end shock absorber installation.



Here is the way to assemble the parts on the end of a bayonet type shock absorber. Draw up the nuts snugly, but do not distort the rubber bushing.

*For a Safer,
Better Ride it's*

Golden Glide

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NOW! An *auto* compass

WITH THE SUPERIOR, SUPER-POWER
ALNICO 5 MAGNET



The
NEW

Airguide
AUTO COMPASS



... leads the field with Alnico 5, the mighty magnet that has 10 times the coercive force and 3 times the residual induction of a steel magnet ... for outlasts and outperforms steel ... gives faster, steadier readings.



... uses an 8 magnet system of aircraft type compensators which has proven most effective in off-setting surrounding metal and electrical current. Adjusts easily and quickly to finest accuracy.



... offers greatest visibility from all angles with the distinct VISI-DOME dial. Clean white details on jet black dome, calibrated to 5°.



... mounts on windshield molding with a double ball and socket bracket which permits complete flexibility of adjustment for convenient reading while driving. Easily installed. Fits all cars.



... harmonizes perfectly with today's modern car interiors. Choice of two beautiful colors, soft gray or tan.



... available with or without light. Lighted model has a warm green indirect glow. With light (suitable for either 6 or 12 volt systems), \$4.95. Without light, \$3.95.

AT
LEADING
STORES

... makes driving more care-free and more fun.

Made and Guaranteed by
AIRGUIDE INSTRUMENT CO., P-4, CHICAGO 47

"Only improvement I could suggest is to do away with trunk 'lip' over which everything must be lifted in or out."—St. Louis, Mo., executive.

"Too many turns required to raise or lower windows."—Mattoon, Ill., student.

"Should change position of chrome strip along side. Paint takes a beating when someone parks beside me and opens the door so hard it bounces off paint instead of the chrome strip."—Chattanooga, Tenn., announcer.

"Inaccessible grille. When I wash the car I leave too many 'holidays.' Only a child's hand could pass between bumper guards and through intake cowls."—Detroit, Mich., teacher.

"No light on Fordomatic quadrant for night driving."—Summit Station, Ohio, highway worker.

"Would like to be able to open trunk without having to unlock it. I live in the country and trunk doesn't have to be locked all the time and I use it often."—Corder, Mo., farmer.

"Ash tray hard to get at under radio."—Rozet, Wyo., rancher.

"Passing gear cuts out too soon."—Travis, Calif., Air Force enlisted man.

Additional Comments

There is a controversy about the use of lights on the dash to warn of low oil pressure and battery discharge instead of the needle-type meter. Most of the owners (66 percent) prefer the lights.

"If trouble develops, you are warned at once."—Snohomish, Wash., body man.

"Light saved motor when mechanics failed to tighten valve covers and oil leaked."—Cooperstown, N. D., bank teller.

"Light indicators far superior to gauges for women and inexperienced drivers, but I prefer meter to read amperes. Flashing light sufficient for oil."—Tacoma, Wash., engineer.

When asked about the new engine, 64 percent of the owners stated they have had no trouble with it. There were 31 percent who had some trouble and 5 percent who had considerable trouble. Here are some examples of the troubles reported by owners in the survey:

"Valves froze at 500 miles."—Lyndhurst, N. J., banker.

"Valves stuck first hour I had it. Tappets loosen up too fast."—Willard, Ohio, electrician.

"Dealer running oil survey to determine exact amount of oil used. Promised to correct excessive oil consumption."—Birmingham, Ala., coal miner.

"Ten-cent oil plug became loose and to

(Continued to page 220)

RELIEVES
HEADACHE
NEURALGIA
NEURITIS PAIN

FAST



Here's Why...

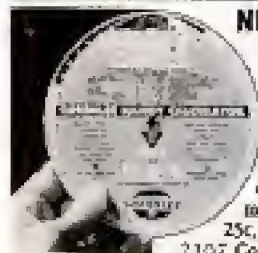
Anacin® is like a doctor's prescription. That is, Anacin contains not one but a combination of medically proved active ingredients. Anacin is specially compounded to give FAST, LONG LASTING relief. Don't wait. Buy Anacin today.

**WHAT'S NEW
ABOUT NEW**



Everything! It's even more accurate, more versatile, easier to operate! See it at your dealer's now. For big, new, free booklet with 20 pages of pictures, data, drop a card to: SHOPSMITH, Dept. 265-B, 12818 Coll Rd., Cleveland 8, Ohio

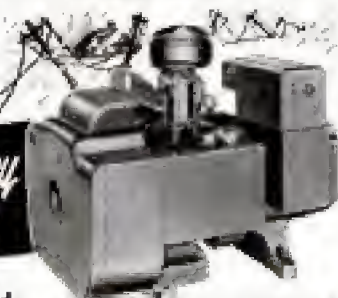
**NEW, IMPROVED CALCULATOR
FOR WOODWORKERS only 25c**



Instantly gives information on lumber, nails, concrete mixes, painting materials, etc. Convenient, simple to read. Just set dial for nail specifications, to convert linear to board feet, find big sizes for screws, compare characteristics of woods. 8" diameter heavily varnished cardboard. Send 25c, no stamps, please to Circular Tool Co., 2107 Columbia Avenue, Rockford, Illinois.

Say You Saw It in Popular Mechanics

Protect your home against power interruptions with an...



**ONAN Emergency
ELECTRIC PLANT**

Provides dependable stand-by electricity for heating system, pumps, freezer, lights, appliances. Keeps home safe, livable. Automatic start and stop. Find out how little it costs!

Write for Folder!

A SIZE FOR EVERY NEED
1,000 to 50,000 watts.
Compact, quiet-running,
easy to install. Gasoline
engine powered.

D. W. ONAN & SONS, INC.
8579 University Ave. S. E. • Minneapolis 14, Minnesota

**A SURE CURE
FOR SICK
HORSEPOWER!**



Triple-Action
**PERMATEX
"TOON-OYL"**



The carbon gums and tars that form in your engine would make you sick too! — These deposits make your engine sluggish — your horsepower balky. Knocks and slow starts are another sign that your engine is gumming up — losing power — wasting gas. Bring your engine back to peak performance with "triple-action" Permatex "Toon-Oyl".

- 1 Toon-Oyl dissolves carbon gums, frees sticky hydraulic valves.
- 2 Toon-Oyl reduces friction by coating cleaned parts with a tough lubricating film.
- 3 Toon-Oyl neutralizes acid action — a principal cause of engine wear.

Get full power from your car. Add a quart of triple-action Permatex "Toon-Oyl" to your engine oil. You'll feel the difference in the first few miles you drive.

Send for free illustrated catalog!

PERMATEX COMPANY, INC.
Brooklyn 35, N. Y.

Over 50 Chemical Products
For Better Automotive Maintenance

Look for the distinctive Permatex label at your service station or garage. It has been your guarantee of quality for over 45 years.

Do-it-Yourself with the new Weldwood[®] PRESTO-SET[®] GLUE

Perfected at last! A ready-to-use glue worthy of the Weldwood name. Works like a wizard on just about everything made of wood, cloth, leather, fibre, paper, etc.

Use Presto-Set to make drapery cornices; to repair luggage, sports goods, furniture, toys, record albums; to mount maps, snapshots, collections, awards, etc.

For fast-setting glue jobs in home, hobby, shop, PRESTO-SET does it all, and better.

At lumber, paint or hardware stores, in 25¢ and 45¢ tubes, pint and quart bottles. If not yet stocked send 25¢ for a full size tube. Larger sizes for industrial users.



READY TO USE!
BONDS LIKE MAGIC!
SETS SO FAST!

LOOK FOR THE NAME & WHITE LABEL

FREE! Leaflet of many uses. Write Dept. PPM-73, Box 205, New York 46
UNITED STATES PLYWOOD CORPORATION



HOW TO GET A NEW GARAGE DOOR AT LESS THAN HALF PRICE!

Yes, you can have a swing-up garage door like the one shown here—complete with Stanley Swing-Up Hardware for less than half what you'd normally pay!

How? Build it yourself from Easi-Bild's[®] Pattern No. B6. It's easy! No special tools—no special skill! Just follow the clear, "can't-go-wrong" directions of the pattern. Tells you everything—including what materials to buy,

where and when to use them. Stanley Garage Door Set is simplicity itself to install. You'll be amazed how quickly you can do the job—and mighty proud of your results.

Ask your dealer for Simplified Directions for Installing Stanley Garage Hardware and Easi-Bild Patterns. Or use coupon below. *Trade Mark Reg. U.S. Pat. Off. — Easi-Bild Pattern Co.

EASI-BILD PATTERN CO., Dept. 5-4, Pleasantville, N.Y.
Enclosed is 50¢ in coin, money order, check for
Garage Door Pattern No. B6

Please send Simplified Directions for installing
() Single () Double Garage Door Hardware.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

replace it whole engine had to be taken out."—Napoleon, N. D., writer.

"Points burned out in first 3000 miles."—San Antonio, Tex., Air Force pilot.

"Stalls when braked faster than normally, especially going down hill."—Orange, N. J., accountant.

Owners Praise Durability

Many owners stated that their Fords stand up well under very rough treatment.

"The car is ready to take any kind of treatment and still stand up under it. I am very hard on a car."—Louisville, Ohio, electrician.

"Stands up under hard driving."—Onawa, Iowa, veterinary.

"I like its ability to take punishment. We live on a sheep ranch and use car to go over the prairie. It takes rough bumps and hard usage very well."—Newell, S. D., rancher.

When asked to give the Ford an over-all rating, 56 percent of the owners described it as excellent, 37 percent as good, only 7 percent said it was fair, and only one owner rated the car poor, less than one half of one percent—a remarkable record of owner satisfaction.

A comparatively high percentage of owners listed no complaints at all—30 percent to be exact. This, too, is owner satisfaction that Ford can be proud of. Many cars much higher priced than the Ford can't match these figures. See the Percentage Table on page 108 for more details on how owners rate their Fords. ★ ★ ★

[Floyd Clymer's road-test report begins on page 107.]

Sound-Absorbing Veneer Ceiling Panel

Paper, resin and a veneer made from wood usually left in the woods as waste, have been combined to make a ceiling panel that absorbs sound like perforated acoustic tile. The panels are made of paper treated with synthetic resins to waterproof and strengthen it, resulting in a one-inch-thick honeycomb. To this are glued thin facing panels of Douglas fir white-pocket veneer. White-pocket veneer comes from the heart of over-mature Douglas fir in which the wood is dotted with minute holes or pitted with a decorative white substance. The holes and white pockets in the wood kill ceiling echoes by permitting sound to pass through the face panel into the honeycomb core, which absorbs and deadens it. In addition, the holes and pockets lend a decorative appearance to the panel, similar to that of pecky cypress.

Your **ELECTRIC DRILL** Trims
HEDGES — SHRUBS — GRASS
with **ROTO-TRIM**
DRILL ATTACHMENT

FITS ANY
1/4" DRILL

Today's Greatest
Hedge Trimmer VALUE \$12.95
Yours, Postpaid, for only **\$12.95** (Less Drills)

Keep your whole yard neatly tailored... trim hedges, shrubs, and hard-to-reach grass easily and smoothly with this new, inexpensive drill attachment. ROTO-TRIM quickly converts any 1/4" drill into an easy handling, keen-cutting Hedge Trimmer.

Quality Built throughout. Rigid steel and aluminum construction with smooth-running hardened steel gears and cast in one-piece case. Cutting blades are 10" long, of high-carbon steel, heat-treated, precision ground and designed for maximum safety and efficiency.

Easy to Use! Quickly attached to drill—flats simplify chucking. Light weight and precision balance make ROTO-TRIM much easier to handle than more expensive trimmers. Handle turns blade to any angle.

Order TODAY! Don't miss this chance to get your ROTO-TRIM Hedge Trimmer Attachment while still available at today's low price of \$12.95.

UNCONDITIONAL 10-DAY MONEY BACK GUARANTEE!
Send check, cash or M. O. and we'll ship postpaid — direct from factory to you.

Dept. 752 **ROTEX COMPANY** 837 WEST DAVIS DALLAS 8, TEXAS

NEW WAY TO CUT PERFECT GROOVES WITH CIRCLE SAW!

Just dial any of 40 cuts. Parallel, clean, no sanding! Leave on saw for regular cuts. For 1/8, 1/4, 3/8 and 1" arbors. At dealer's or order direct! **Only \$4.95 per set**

Send for free booklet

WARREN DADO WASHERS CO.
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REVIVE YOUR OLD PAINT BRUSHES

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Launders engines faster, more completely, and safer than steam cleaning (warm the engine). Self scouring action brings out factory new appearance... provides accurate visual inspection... Gunked engines run cooler.

Get Genuine Gunk in quart and larger sizes at better wholesale auto suppliers throughout the country... flatly refuse imitations.

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Your garage can be neat and tidy. Use these easy-to-put-up 4-ft. x 8-ft. panels with handy hangers.

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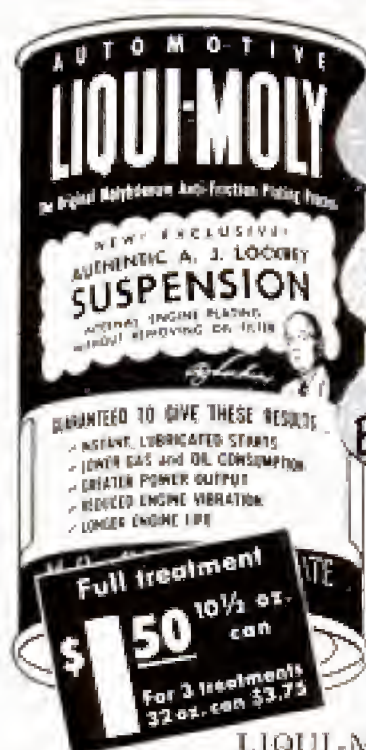


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Floyd Clymer's Road Test of the 1954 Ford V8

(Continued from page 107)

more economical and has less vibration than the old flat-head engine.

The ball-joint front end is outstanding. Not only does the car steer more easily but cornering at all speeds and maneuverability have been improved by this feature. I'd rate Ford tops in the low-price field for handling.

The test car was equipped with power steering. The driver retains normal feel of the road that is not evident in some other types of power steering. Over-all ratio with or without power is 25.3 to 1, with 4½ turns of the wheel from lock to lock.

Ford power brakes are the best I've found on any car tested. There seemed to be less fade and under all conditions the pedal retained the same movement—even at high speeds, in the mountains, the desert heat and through a hard rain for 200 miles.

Gasoline economy was good (see Economy Test page 110). The engine uses regular gas. (In the 1954 Mobilgas Economy Run a Ford V8 averaged 23.38 miles per gallon to place third. A Studebaker Champion won with 29.58 miles per gallon.)

Fordomatic Drive has the advantage of positive automatic gears plus the smoothness of a torque converter. The automatic intermediate gear provides fast getaway. The drive is constant through the converter and there is no clutch for rigid connection between engine and rear wheels. The converter is air cooled. Although upshifts can be felt, they are smooth. Starting in Drive with moderate throttle, there is a slight hum while accelerating. All gear changing takes place smoothly and almost effortlessly between 17 and 65 miles per hour, depending on throttle opening. With wide-open throttle it upshifts at about 60.

Over Donner Summit, we reached an altitude of 7135 feet. The car performed exceptionally well. We were in a severe storm during which rain, sleet and snow fell for a couple of hours and the Ford handled very well on the slippery highway.

The body is solid and tight. No water leaks developed. Doors open and close easily. A couple of squeaks and rattles developed and for some unknown reason disappeared.

Driving position is comfortable. Vision through the curved windshield is good. Rear vision is excellent. The top half of the steering wheel is sometimes in the line of forward vision. I'm a tall person and shorter persons must find the steering wheel

(Continued to page 224)

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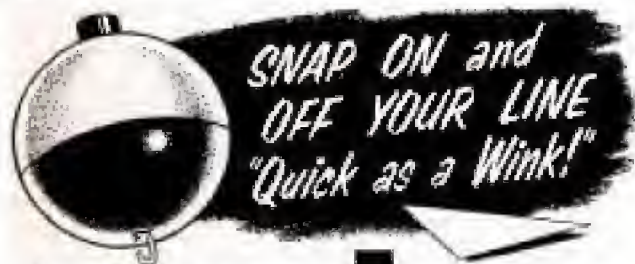
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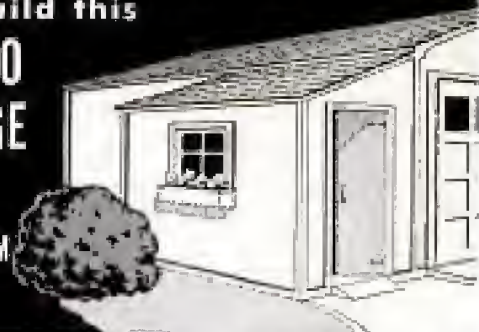
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The Dynatone Muffler—with the Deep Mellow Tone—is also Available for Single Installation

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located too high. Either a smaller wheel or a lower steering column would eliminate this annoyance.

Instrument panel is well protected from sun glare. The switch-key-starter is operated by the left hand, awkward for most right-handed drivers. Ford sticks with the hand-operated choke and I'm just old-fashioned enough to like it.

The heater is efficient, but the control levers could be simplified. It was necessary to use the blower to get enough heat during the cold stretches. Windows require four turns to open or close—this is excessive.

The speedometer is directly in front of the driver and easy to read. Ford now has a transparent plastic insert in the speedometer housing and daylight comes in through it to light the back of the numerals. Elimination of the upper half of the horn ring has aided driver's vision. Warning lights are used for generator and oil signals. I prefer regular needle gauges.

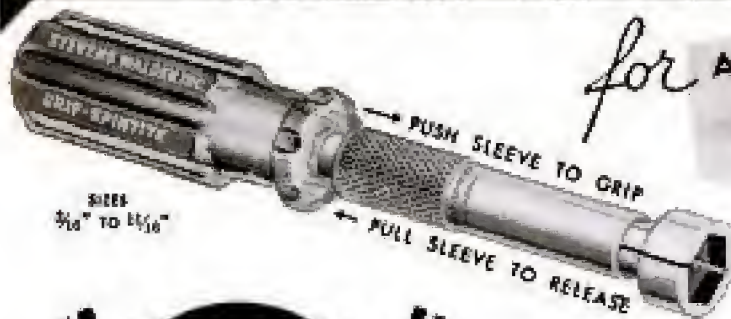
It is obvious that Ford is becoming more popular with owners and the new overhead-valve engine must have something to do with it. For the first time in many years, Ford was in top place in sales during the first three months of 1954. ***

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Both the windshield wiper and the washing jets begin operating when you step on the button of a new attachment for Chrysler Corporation cars. You don't have to fumble with two controls. Fluid is contained in an unbreakable, vinyl container. Washer and wiper are started and stopped by the foot control. To turn on wiper alone, you use the regular dash control.



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UNITED STATES GYPSUM

The Greatest Name in Building

It's Raining Baby Trout

(Continued from page 122)

these little, blue tarns are surrounded by peaks, and only precise handling of the plane will clear them safely.

For some time Al Reese worried over the many tons of water which had to be carried to keep the little fish alive. In the 1952 planting he carried a total load of 25,000 gallons of water over the mountains. Could the work be accomplished with less?

The answer came with experiments in drugging small trout. Ordinarily the fish are active and alert and use a great deal of oxygen. Experiments showed that sodium Amytal, a barbiturate, would quiet the fish when a half-grain of the drug was added to a gallon of water.

Thus only one-third to one-half as much water had to be carried, for the fish enter a state approaching suspended animation. Only 200 trout were formerly carried to a gallon of water. The drug now permits 500 or more to the gallon. Tests proved that the fish were not harmed by the drug and became normally active after the drop.

A major operation in 1953 was the stocking of 46 high-altitude lakes with the exotic golden trout, native only to the Sierras and found originally in only one small stream near Mt. Whitney.

Landing at the Tunnel airstrip in the mountains, one of the highest landing fields in the nation, trout which had been taken with hook and line were flown down to the hatchery to be used for brood stock. And other goldens, already raised there to fingerling size, were flown back over the peaks to stock the lakes with 200,000 of these rare and beautiful fish.

The airplane promises a big future for these beautiful and gamy specimens. They will not retain their bright coloring in low-altitude waters and are best adapted to lakes lying from 10,500 to 13,000 feet. Pack-train transportation to these remote waters is only possible for a scant two months in summer when trails are clear of snow. The plane can drop them early in the season and after autumn snows close the trails.

The time saved in aerial planting is enormous. A 40-minute round trip from the hatchery can plant remote lakes, far back in granite-ribbed basins which would take a pack train loaded with fish cans at least two days to reach. Cost of operating the plane is figured at about \$32 an hour.

The longest haul from take-off point to planting location was 140 miles for the round trip. The highest lake planted was in the Mt. Whitney area, at 13,600 feet, less than 1000 feet below the top of the highest mountain in the United States. ★ ★ ★

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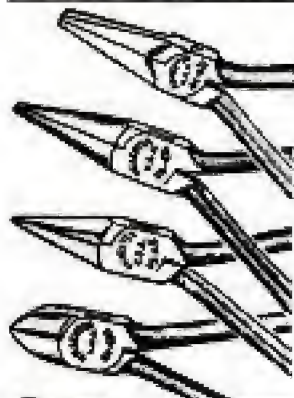
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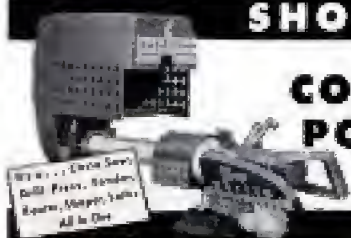
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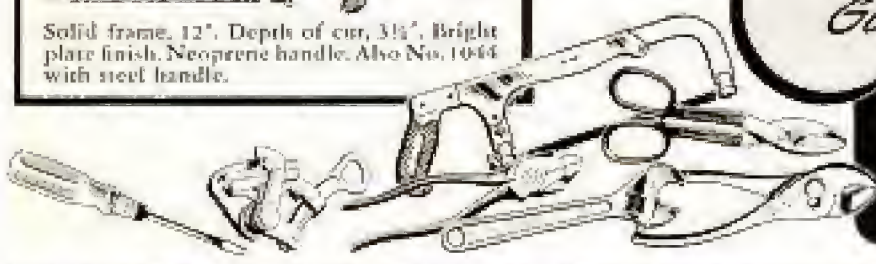
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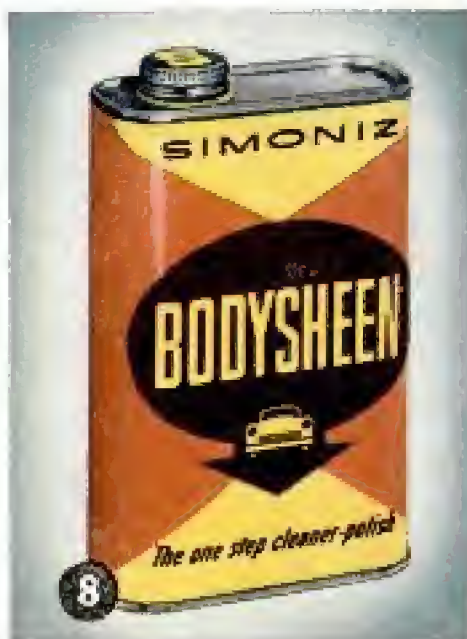
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5

Drednaut Hydraulic Jack takes work and danger out of tire changing. Easy wrist-action lifts any car. Twist—it's down, safely and smoothly. Precision built to meet most severe passenger service requirements. Raises from 7" high to 14 1/2". Pumping handle included. (246188) \$9.95



6

Complete Wizard Tune-Up Kit saves gas, gives your car easier starting, smoother running, better performance all season. Easy to install yourself. Contains all ignition parts needed for complete tune-up: heavy duty points, condenser, rotor. Complete, easy instructions. Chev. 1933-52 (24615-0) \$1.05

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10

Why risk worn brakes? Reline with Stop-Rite Brake Linings. Designed for individual braking requirements of all cars. Pressure molded. Wire backed for extra strength. Will not absorb grease or moisture. With rivets and instructions. Easy to install. All popular cars from..... \$3.45



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Wizard "Twin-Fire" patented spark plug gives top performance twice as long as single electrode plugs. Each electrode fires one at a time while the other "rests", stays accurately gapped up to twice as long. All chrome shell prevents rust. Guaranteed 18,000 miles. Each, in sets..... 75c



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Spotlight where you need it! Just plug this portable spotlight into lighter socket: use for street signs, tire changing, house numbers. Wire stores on reel-type handle when not in use. On-off switch. GE bulb, 10' cord. Plastic construction, with metallic finish. Plastic storage bag. (24615-0) \$3.75

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How to...

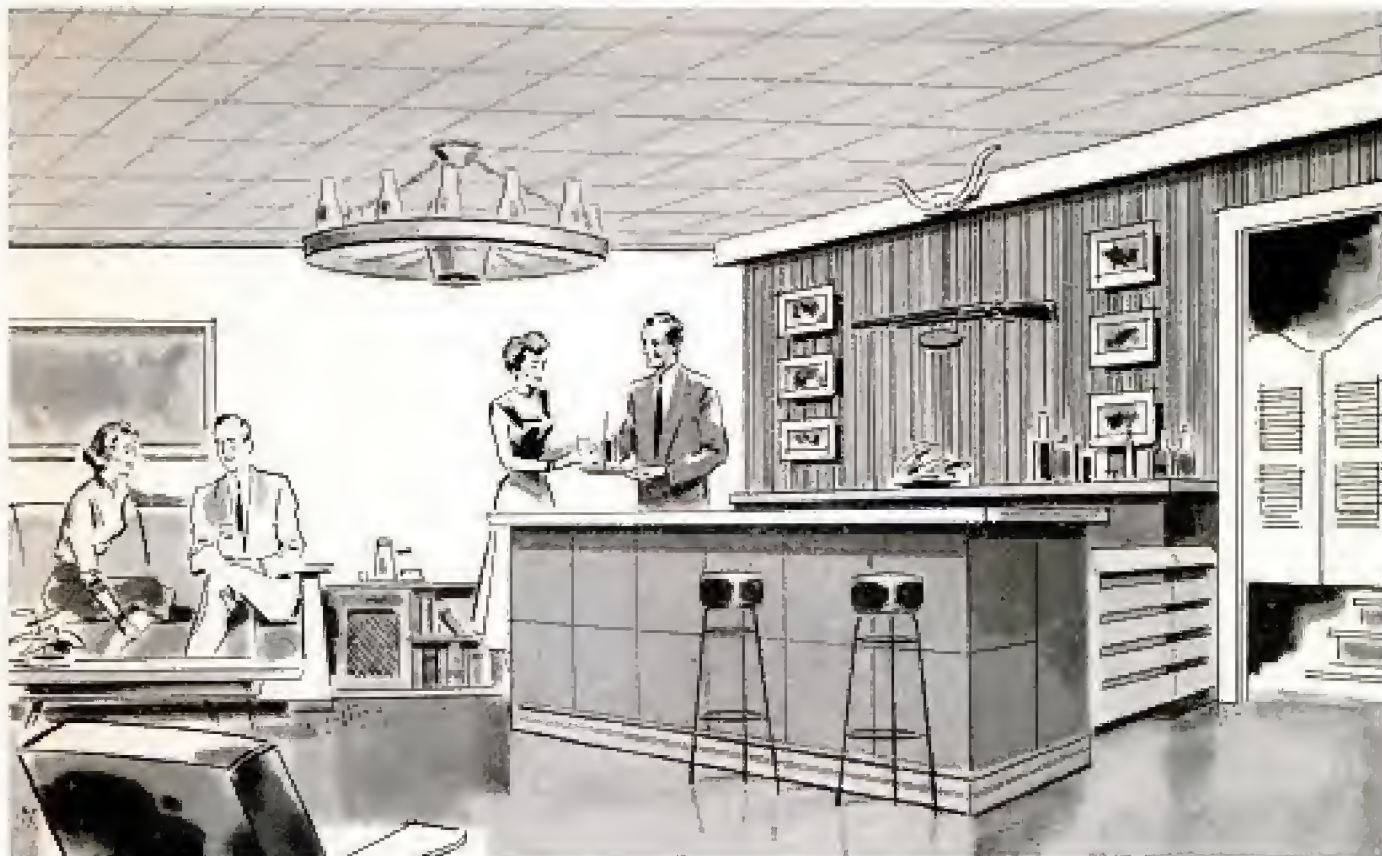
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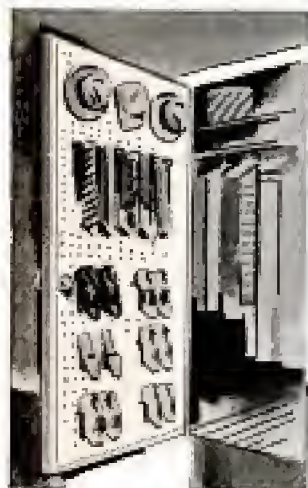




Three types of Upson Panels are used to finish this striking recreation room. See below for details.

Ideas for weekend remodeling

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Upson makes a complete line of Panels for remodeling your home. In the recreation room pictured above for instance . . . the ceiling is covered with Upson Ceiling Tiles, washable, durable, attractive. The wall behind the bar is stunning Upson Striated Panel, easy to apply, easy to paint. The far wall is Upson Strong-Bilt Panel, a

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See your lumber dealer and look over every Upson Panel type. Insist on the name "Upson" for top quality material.

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↑ Idea. Cover inside of closet doors with Upson Peg-it Panel. Makes handy storage space.

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**DYNAMIC INDUSTRIAL type
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75 amp. output for industrial
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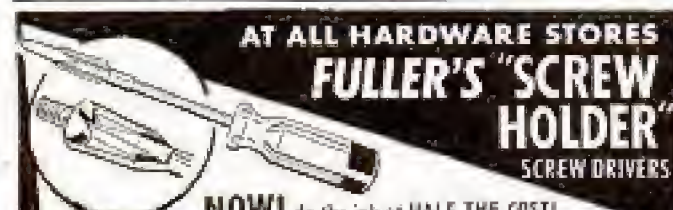
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Free Details and "How to Weld"



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**FULLER'S "SCREW
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SCREW DRIVERS

NOW! do the job at **HALF THE COST!**

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A PERFECT PICTURE OF YOUR BEST BET — BULLDOG COUPLERS!

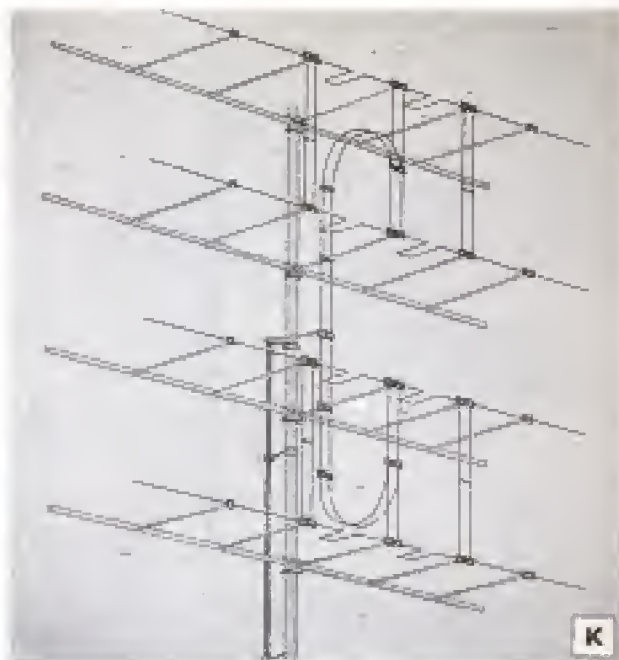
Model No. 1-C For light-duty trailers,
capacity 2500 lbs., 1 1/4" ball with nut
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"As old as the Industry"
WAUSAU, WISCONSIN



How to Select Your Television Antenna

(Continued from page 147)

areas a TV-antenna booster will sometimes be required. If you are close to powerful TV stations you can often get satisfactory results from an indoor-type antenna of the "rabbit ear" type, or with one built into the set by the manufacturer.

In its simplest form the ideal long-distance TV antenna is a type that has been employed by amateur radio operators for many years, for both receiving and transmitting. It consists of a receiving-rod element (dipole) shaped like a hairpin, measuring exactly half the wavelength of a single channel, a twin-line lead-in goes from its center terminals to the antenna posts on the TV set. A rod behind this dipole acts as a reflector to bounce the signals back to it and into the line that goes to the set. A third element in front of the dipole is called a director. The director acts like the front lens of a telescope to select and amplify the signal, which in this case is concentrated on the receiving dipole.

The length of the elements and the spacing between them is determined by the use of the electrical formulae. Several director elements in front of the dipole act like multiple lenses to amplify the signal before it reaches the dipole. Variations of this design give excellent results on the TV channels. Although ordinarily limited to a single-band array, new developments in design provide true Yagi high-grain performance on all of the VHF-television channels 2 through 13 using a single array.

A stacked array of this type is illustrated

(Continued to page 236)

JOBS ARE EASIER WITH THE
Westinghouse
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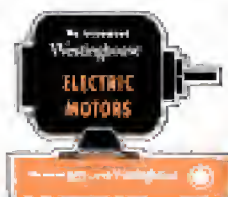
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Please send me a copy of your FREE Handy-Craft motor guide.

I would like complete drawings and instructions for constructing the Handy-Crafter coffee table.

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Oil-pumping is just the start of expense and trouble—the first danger signal from worn-out piston rings. The longer you let those old rings stay in, the more oil you'll use, the more power you'll lose, and the bigger your repair bill will be!

As your engine gets older, it runs hotter because of accumulations in the cooling system. The cylinders wear tapered and out-of-round—need more oil on the walls.

It requires a special type of piston rings—*replacement rings*—to deliver this extra oil, under full control, without waste.

Hastings pioneered in the development of steel oil-control rings and revolutionized the entire piston ring industry. Hastings makes replacement rings exclusively, devotes all its research, on the highways and in the laboratory, to the particular replacement problems of each make and type of engine.

That's why Hastings Rings *stop* oil-pumping, *check* cylinder wear, *restore* engine performance—in re-ringing, re-bore and re-sleeve installations.

So go to your motor specialist at the first sign of oil-pumping or performance drop-off. If rings are the trouble, ask him to install a Hastings Steel-Vent replacement set. Truly the best money you can spend on your car!

HASTINGS MANUFACTURING COMPANY • HASTINGS, MICHIGAN
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Piston Rings, Casite, Castlube, Droul, Oil Filters, Spark Plugs

HASTINGS STEEL-VENT PISTON RINGS

Regular or Chrome



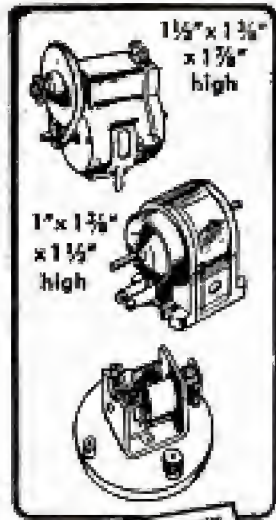
TOUGH on Oil-Pumping
GENTLE on Cylinder walls

in photo A. Designed for fringe and ultra-fringe installations, it consists of two complete arrays stacked for maximum gain. Where extreme-distance reception is not required, a dipole and reflector alone or, with a single director added, will give satisfactory results. The manufacturer cuts the elements to include the average of all the frequencies in one band. For example, you can have a hi-low Inline array with short elements to receive channels 7 to 13, and another longer element array below it on the mast to receive channels 2 to 6, and FM sound which lies between channels 6 and 7. Another variation is the UHF-VHF rhombic-conical shown in photo B. The rhombic, or diamond-shaped section is for UHF and the conical section for VHF reception. This combination covers all channels 2 through 83 and is useful for trailer-TV installations for extensive travelers.

The UHF channels 14 to 83 are the shorter waves and the signals are not receivable as far as the VHF signals. These waves are so short that the elements and spacing become miniature in comparison to VHF arrays. You should consult your newspaper and local authorities as to the type of TV reception now available or planned, in your locality, before buying or changing, your TV antenna. Photo C shows an adjustable VHF-UHF stacked-V antenna. The angle of the vee peaks a certain frequency range. This double-V array requires no reflector and, like the Yagi, it is very directive. Photos D and E, show the Bo-ty UHF antenna which is a variation of the simple dipole, with triangular sheets of metal instead of rods. The stacked type for fringe areas is illustrated in photo E. These specialized UHF antennas are equipped with reflectors for increased gain and the rejection of unwanted reflections from back and sides. The stacked type is for increased gain in weak-signal areas.

For those who must use a combination VHF-UHF indoor antenna, the one shown in photo F has been tested with highly satisfactory results claimed. One type of VHF stacked fringe-area antenna favored in many localities is the conical array, illustrated in photo G, which has dipoles arranged like the ribs of an umbrella. It is claimed to have high gain and low-loss features, and comes in one preassembled unit. In photo H we have an adjustable V-beam. One position provides high gain on all VHF channels, another position on all UHF and VHF channels. One TV-set manufacturer makes available 9 TV outdoor-antenna kits, one of which is shown in photo I. A double co-lateral all-channel array for ultra-fringe areas is illustrated in photo K.

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POWERFUL-COMPACT-PRACTICAL**



Wilson's dry-cell operated motors are "tops" in design, sturdy construction, electrical characteristics and power. Thousands in use by model builders, experimenters, model railroaders and in industry. Three tested styles—every one FULLY GUARANTEED.

Model 5002—Metal cased, reversible, Alnico-field motor with built-in speed reducer. Pulleys for 4000 and 3000 RPM. Mounting bracket and belt supplied. For 3-4 1/2-6 volts. Price \$3.00.

Model 3100—"Tiny Atom" motor—speeds up to 6000 RPM. Double extended shaft. Permanent Alnico-V magnet field, wound rotor. Heavy duty transparent plastic case. For 1 1/2-3 volts, price \$2.50. For higher voltages, price \$2.50.

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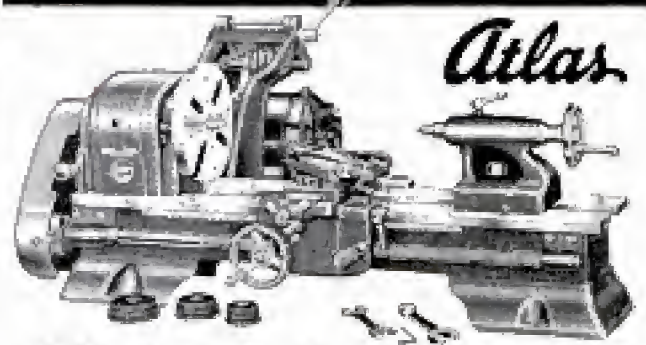


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3-IN-ONE's Oil-Spra protects tools with fine mist of oil! Press button for penetrating oil spray! It's so easy to use!

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Make \$20 to \$30 a Week EXTRA MONEY!

With the high prices of food, clothing and everything else, just think what you could do with extra money every week! Turn your spare time into CASH—sharpening saws with a Foley Automatic Saw Filer pays up to \$3 or \$4 an hour. Start in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons, No canvassing—"I advertised in our local paper and got in 93 saws!"—says M. L. Thompson. With a Foley you can file all hand saws, also band and cross-cut circular saws.

FREE BOOK Shows How to Start

It explains how you can get business from home owners, farmers, carpenters, schools, factories, etc. "I get work from 20 to 30 miles away"—says Charles H. Smith. Free Book, "Money Making Facts," tells how to start. Send coupon today—no salesman will call.



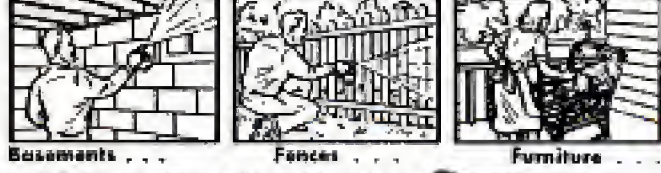
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about her hedges!



Porter-Cable

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HEDGSHEAR

Whose neatly trimmed hedges stir all the favorable comment in your neighborhood? Chances are they belong to the homeowner using a Yardmaster Hedgshear!

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Behind the Split Screens of TV

(Continued from page 77)

the building roof, which is in three levels, to the marquee and then across the street.

"But the trolley-car maintenance crew," said an engineer, "took the camera cables over their high-voltage lines across the boulevard for us."

Close to the television booth backstage was an improvised telephone control center roped off in a corner. Here all of the incoming and outgoing video feeds were regulated and monitored.

"Really, there were no problems to speak of," a telephone supervisor said, "for NBC gave us the order in plenty of time, with at least four full days to install equipment."

While NBC had one microwave, the telephone company had eight. They actually used six, with two in reverse. Six circuits and two spares all were going to their Gower Street control center in Hollywood. In addition, there were eight audio lines for radio and TV, one circuit each for production and engineering, and a private phone to connect Donald O'Connor to the studio in Philadelphia, not to mention many business telephones.

Equally as interesting as the split-screen effect was the method of delaying the arrival time of the video signals from the Hollywood film studio and the Burbank commercial studio in order to tie them all together at the Pantages, thus allowing fades from one to the other.

Precaution is an engineer's middle name. He is always ready with an answer if a crisis rears its head. Therefore, that afternoon the crew used the emergency gasoline-engine power supply for the rehearsal, just to be sure it would carry the load if needed. As stand-bys, there were a special 1000-ampere d.c. generator for lighting and the telephone company's separate gasoline generator.

Throughout the day, as problems cropped up, they were speedily solved. There was no complete rehearsal, only segments. A microwave cable had moisture in it, but it was replaced. There was a round-robin feedback but it was remedied by reducing the speaker level in Philadelphia.

It was certainly no accident that the final star-studded production glided by as smoothly as an Olympic skier. So closely knit was the show, few people realized the dancers in the commercials were in the Burbank studios, yet using the orchestra music from the Pantages Theater, several miles away, that Philadelphia and New York were not sitting in the front-row seats and that the insert from Mexico was a film from another studio. ★ ★ ★

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BIGGER!! 25 TON MASSIVE!!
HYDRAULIC CYLINDER
 • ALL STEEL CONSTRUCTION
 • 8" BORE—10" STROKE
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50,000 LBS. PRESSURE WITH LONG P.S.I. PUMP OUTPUT.

- UP TO 70,000 LBS.—CAPACITY ON INTERMITTENT SERVICE.
- SOLID STEEL 2 1/2" PISTON ROD
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Replacement cost—\$300.00. Shipping Wt.—185 lbs. **SPECIAL PRICE F.O.B. Chicago..... 95.00**

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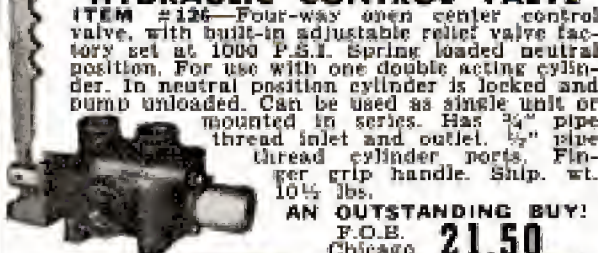
- Insecticide Pumping and Spraying • of D.D.T., 2-4-D, Chloridane, etc.
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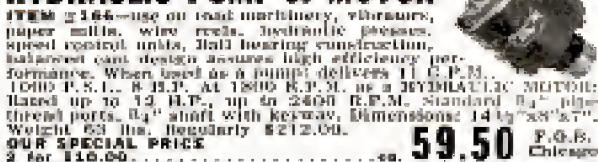
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ITEM #126—Four-way open center control valve, with built-in adjustable relief valve factory set at 1000 P.S.I. Spring loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. Has 3/4" pipe thread inlet and outlet, 1/2" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10 1/2 lbs.

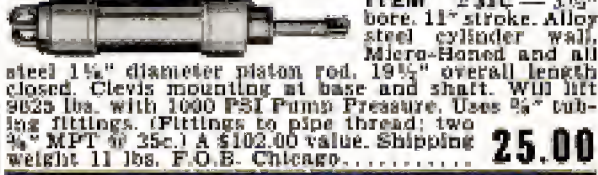
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KROIL, the amazing chemical lubricant, creeps into millionth inch spaces and loosens frozen metal parts when all others fail. Used by 12,000 leading industrial shops. Try KROIL on money back basis—gallon \$3.85 FOB factory—or send \$1.50 for two 8 oz. spout cans—Postpaid.

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 "My Belsaw Sharp Smith gives me big profits at low expense — I can run 35 to 40 Circular Saws in an 8-hour day — that makes me \$40 cash."

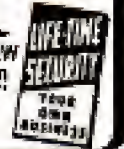
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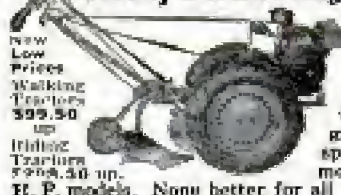


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SHAW "DU-ALL"

Garden and Small Farm Tractors

Sturdy Work Saving Walking Tractor



New Low Prices Walking Tractors \$99.50 up
 11-hp. Tractors 299.50 up.
 H. P. models. None better for all 'round work.

Best buy in 1 1/2, 2 1/2, 3, 5 H. P. Handle 6, 8, 10 inch plows. All tools and attachments. Variable speeds, adjustable wheel widths, individual gang tool controls. Three speeds and reverse automotive gears on 3 and 5 H. P. models.

New, Low Cost, Streamlined Riding Tractor

3, 5, 8 H. P. Pull 8, 10, 12 inch plows, 28 inch tread, 6 1/2 inch wheel base, 3 speeds and reverse automotive gears, individual brakes and in short turning. It is 7 M.P.H. Nothing else like it in a power-ful, practical tractor at bed rock cost.



Inexpensive Tiller..Lawn Mower

Nine inch rotor pulverizes up to 12 inch swath 6 inches deep, or less. Extremely low cost. Rotor quickly replaced with single wheel for lawn mowing, hauling, etc.



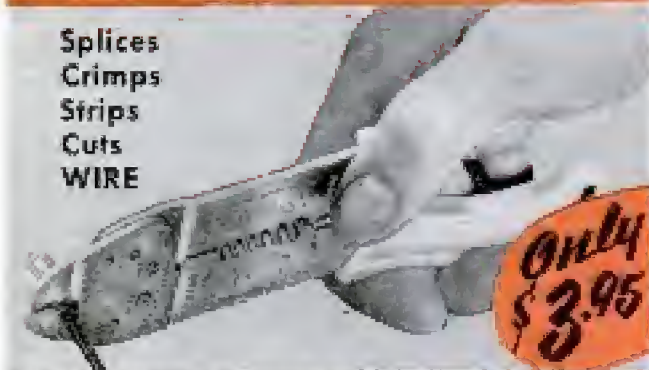
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Rush me a Champ Tool, I am enclosing \$3.95.

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 Address _____
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Midget Subs Play Target for Killers

(Continued from page 39)

of conning tower. Fortunately the damage was all in the outer skin.

The real fun for submariners comes when they fire dummy torpedoes at their attackers. "They're supposed to fire below the ship," Lt. Holt explains, "but once in a while, a 'fish' will act up. Once or twice I've seen them hit a ship—and believe me, even a dummy packs a wallop. Those boys know they've been hit. The fish leaves a dent that doesn't get pounded out in an auto-body shop, and I saw one that punched a hole in a target ship."

Despite his enthusiasm for the war games, Commander Morton has a fine regard for the safety of the men under water. There's nothing a sub skipper hates more than another sub working in the same area with him. Since he can't see out, he must depend on instruments that can't see in all directions at once. The grim spectacle of two subs ramming each other 100 feet deep in the ocean is not pretty. "We saw a group working in toward us the other day," says Morton. "Suddenly the surface ship contacted us and reported she'd lost her sub. So, out we went over the underwater phone—contacted the missing sub, then rang our sub in on the same frequency and held a three-way conversation. In a few minutes we had headed both subs in opposite directions and surfaced them—much to the relief of everyone. That underwater phone is one of the best things we've got on this DE besides the Mark V."

A day's exercise at Key West is never finished until the last DE has made its last run on the midget sub—and, like batters at batting practice, any DE skipper wants his last crack at the ball. It's usually late afternoon when Captain Holt takes off his headset and passes the word: "Stand by to surface. Yellow flare away."

"Yellow flare away, sir," shouts Frenchie or Smitty, or John Ott, or Jim Dudgeon—or whoever happens to ram the aluminum cylinder out the ejector tube in the tight space behind the crew's quarters.

"Blow the main ballast," orders the skipper. "Blow number one." There's a rush of water, a hiss of air and up goes T-2.

"Open the main induction!" Warm fresh air swirls into the midget. Ears pop as the pressure goes out with a hollow roar. Holt and McQuilling climb through the dripping hatch to the conning tower, and T-2 plows back to Key West, draining white foam from her plunging sides. She's earned her keep another day. ★ ★ ★

Make BIG SAVINGS With FACTORY-DIRECT PRICES!



HAND WINCHES AT FACTORY PRICES
 3 to 1 ratio-200 lb. pull. Drum has 1 1/2" spool, 6" flange. Takes 75 lb. of 3/16" cable. Stop locking pawl... \$16.85
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 1/2 HP motor gearhead driven winch with anti-rill 100 200 lbs. 250 1000 lbs. \$98.00

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 Super-duty 3/4 HP ball bearing, with 24 to 1 worm gear reduce. Length 24", width 28", height 17". Pull 3500 lbs. complete with 100 ft. of aircraft cable, up-and-down buttons. \$248.00
 (All electric motors. Heavy-duty. Repetitive-Induction. Instant Reverse. 110 V single phase. 3 phase available.)
 Complete Stock of Limit Switches, Magnetic Brakes, Magnetic Reversing Switches, Aircraft Cable
CABLE 1/2" pre-formed aircraft cable... 17c ft.
 3/4" pre-formed aircraft cable... 12c ft.

HOT ROD SUPERCHARGER

Extra soup and so at a price you can't afford to miss! MP'd by Hump-Wagner. Specifications: 7 1/2" deep, 7 1/2" high. Wgt. 17 lbs. Compact and sturdy. 4 base mounting holes. 3/4" outlet. 3/4" shaft with female. Lowly mounting. Priced today at \$85.
SPECIAL: NEW only. \$31.00 USED \$18.95



Here are only a few big \$ \$ \$ savings! More in our catalog!

Air Compressor	Electric Motors	Hand Tools	Rubber Cable
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Booth Trailer	Elevator incline	Stacker	Slamers
Band Saw	Fans, Exhaust	1 Beam Trolley	Tools
Compressor	Fans, Heat	Lawn Mower	Transformers
Accessories	Booster	Sulky	Whaling Hoist
Clutches	Gas Engines	Magnetic Starter	Wilson Vice
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Drop Cords	1/2 Ton Wagon	Pumps	Fire Extinguisher
Electric Hoists	Male Fire Pump	Reduction Gear	4 Wheel Trailer

Get this catalog! 88 pages, packed with useful charts, information, plans for dummies & incline elevators, more than 1500 tool and equipment items at money-saving, factory-to-you prices. Send 25c (refund with first order) or write on company letterhead for free copy.

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AMAZING FOOT-A-MINUTE (7,200 Strokes Per Min.) CUTTING SPEED!



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NEW P1 GENERATORS
Electric Auto-Lite, 200 Amps, 24 Volt, 2500 RPM, Dandy arc welder. Wt. 53 lbs. Approx. Govt. Cost \$430. NEW. \$17.99 Incl. easy to follow diagram.

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MICROMETERS Chrome plated, precision engineered, carefully looked to give long life. All new 0-1" cap, \$2.25 ea., 1-2" cap, \$3.50.

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LITLAPRECISION — Imported. Used by machine shops at Lockheed, Douglas, Bendix, GM, RCA, GE, Model 81/2E. Genuine Helios. Hardened lapped precision surfaces. 1/1000" and 1/128" graduations. Handy slide roll and thumb lock. Quick, accurate depth. A \$25 value, Satin finish, ALL NEW, just \$6.80. Leather carrying case, \$1 extra.

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Use to run antenna, open or close doors and windows, barbecue, displays, etc. Approx. 1 RPM, Set for 140° turning with limit switches that remove for just 360° turning. 1 Amp, 24 volt D.C. 1/2 in. shaft dia, 3" RPM, 1/10 HP motor, micro-switches, reduction gears, mounting brackets — Indigrist! Barker-Coleman. Approx. GOVT. COST \$10. Like new, only \$3.90.

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Manufacturer and marketer of nationally-advertised line of automotive products now expanding operation here and abroad. Distributors needed to warehouse and administrate to growing dealer network. If you have organizational ability and are financially responsible, write for details.

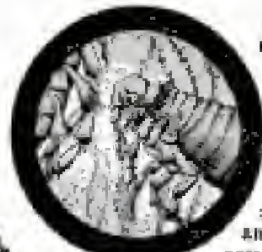
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Send Money Order or Check. We pay postage. No C.O.D.'s.
MIAMI MAGNET COMPANY, 3240 N. W. 27th Ave., Miami 42, Fla.

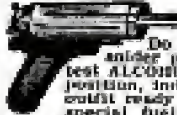
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JOINS ALL METALS PERMANENTLY
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28" x 38" x 20"



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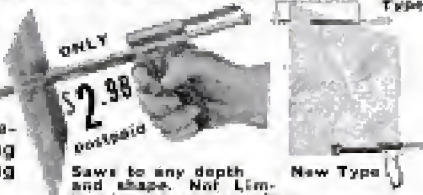
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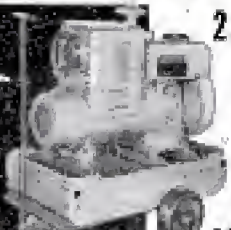
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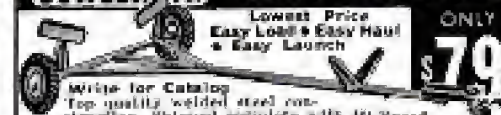
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Small parts shipped parcel post prepaid at above prices.

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All 6 Inches Square As Listed Below

BROWN FIBRE 1/4" - 1/2" - 3/8" - 1/8" THICK - RED RUBBER 1/4" THICK COMPRESSED ASBESTOS 1/4" THICK - ASBESTOS PAPER 1/4" THICK CORK 1/4" THICK - CORK AND NEOPRENE 1/4" THICK

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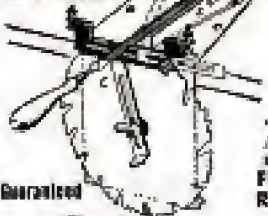
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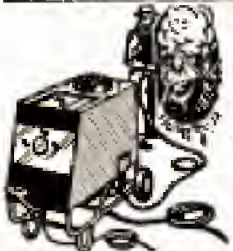
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110-120 v. 60 cyc. AC. Absolutely the best made — exclusive dynamo — 12 1/2 hp. armature heavy windings develop up to 2500 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or a 10 HP Wisconsin engine — complete with all accessories: engine easily disconnected for other uses. Big metal box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 21) Wt. 210 lbs. Reg. price \$545. Special at... **\$299.50**



(Item 21)

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Now, a new super efficient portable steam generator that provides live steam at 100 lbs. pressure in 30 seconds from a cold start! The first quality steam blower ever offered at this low price. Instantly cleans sticky grease, dirt, rust, old paint, etc., off mowers — farm implements and road machinery. Pays for its self in a few weeks. Sterilizes as it steams — milking machines, tanks, milk lines, hot houses, chicken houses and brooding pens. Ideal for sterilizing soil in greenhouses and hot beds — churning out frozen earth, water pipes, motorcars, etc. Works in a flash. Fully automatic — all fitted with built-in water circulating pump. Draws water from faucet or from barrel or bucket. Simple and safe, anyone can use it — built-in safety valve. Complete with new triple efficiency jet steam gun — automatically mixes in case of detergent if desired. Has 17" semi-pneumatic wheels. Wt. 250 lbs. (Item 22) Reg. price \$100. Factory price... **\$298.00**

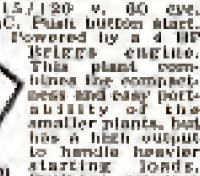
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Super heavy duty, made of heavy rubber insulated #14-2 conductor, stranded wire enclosed in a treated braided jacket. So tough that you can drive over it. Use indoors or out. Heats oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Complete with heavy rubber plug and outlet. (Item 23) 40 ft. 2 1/2 lbs. **\$1.99**
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PORTO-POWER 1500-1700 WATT PLANT

115/120 v. 60 cyc. AC. Push button start. Powered by a 4 HP Briggs engine. This plant combines the compactness and easy portability of the smaller plants, but has a high output to handle heavier starting loads. Built-in winding for charging 12 v. batteries. An ideal standby power plant for operating lamps, sump pumps, oil burners and communication systems. Perfect for contractors and line crews. (Item 20) Wt. 140 lbs. Factory Special Price... **\$279.50**



(Item 20)

MASTER-LITE 2500 Watt Plant

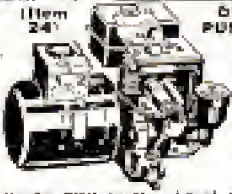
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GENERATOR ONLY for belt drive... **\$239.50**



(Item 21)

PORTABLE LIGHT PLANTS

Ideal for your camp, cottage, trailer or boat.



500-700 WATT PUSH BUTTON START

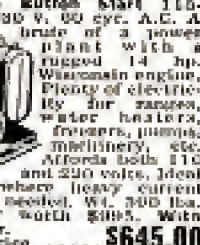
110 v. 60 cyc. AC. Powered by a rugged 1 HP Briggs engine. No starting necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc., which require up to 700 watts. Ideal for Civil Defense and Fire Dept. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Ready fit in car trunk. Be prepared if storm knocks out power lines. Reg. \$275 value... **\$143.50**
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We make fully automatic controls to operate any of the above light plants. Write for details. We make all sizes up to 25,000 Watts.

44 PC. SOCKET SET

Same unconditionally guaranteed, non-erasable sockets as above. Complete range of 21 sockets from 1/4" thru 7/16" (3/4" drive) & 7/16" thru 1 1/8" (3/8" drive). Two sockets, reversible. 1/2" ratchet. 3 drift punches, sliding "T" head, all angle combiner. 1/2" speeder, 3/4" breaker, 5 pc. high chrome alloy combination wrench set and 8 pc. offset wrench set in big dophouse tool box with ample room for other tools. Reg. \$49.95. Wt. 10 lbs. **\$27.95**

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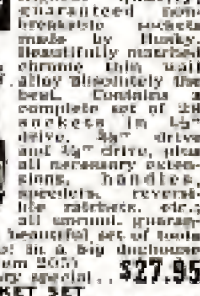
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A Dependability Proven Hydraulic Press, capable of exerting 98,000 lbs. pressure. Pays for itself many times over — straightening bent iron, bending rods, king pins, crank shafts, axles, link pins and bars — or pushing out frozen bearings and bushings. Developed pressure under precise control and visible at all times on accurate gauge. Complete with both large and small models and fits to establish any kind of curve or bend. (Item 264) Wt. 110 lbs. Actual list price \$245. Our special close-out price... **\$69.50**



52 pc. SOCKET SET

Highest quality, guaranteed sockets made by Husky. Beautifully machined chrome this will alloy absolutely the best. Contains a complete set of 28 sockets in 1/4" drive, 3/8" drive and 1/2" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all universal, guaranteed sockets that will handle any job in 5/8" diameter steel box. Wt. 17 lbs. (Item 265) List price \$62.00. Factory special... **\$27.95**



MASTER AIR COMPRESSOR

COMPARE! This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs. (Item 266) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing & the hundreds of other jobs done by compressed air. 24-gal. type. 2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switches that start and stop motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, valves, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed SAFE. Low factory prices. With 1/2 HP, 110 v. AC motor... **\$109.50**



AIR COMPRESSOR ACCESSORIES

Pressure Gauge, range 0-100 lbs. 1/2" pipe thread connection. 2" face... **\$1.50**
Check Valve, solid bronze, 200 lbs. pressure, works in all positions, 1/2" or 3/8" pipe threads, specialty... **\$3.35**
Pressure Regulator, solid brass, add 3/8" pipe thread, reduces any pressure in a range of 0-50... **\$3.75**
Pop Safety Valve, adjustable from 0-200 lbs. 1/2" pipe thread... **\$1.40**
SPECIAL... All four above... **\$8.95**
Pressure Switch for pumps and compressors, 0-85 lbs., \$8.95; 0-250 lbs., with uncoiler 12 3/8" x 1 1/2", \$12.95; 0-300 lbs., 12 3/8" x 1 1/2", \$12.95



HEATING & VENTILATING FAN

Blow hot or cold air through and turn on pipes. Forces warm heat to all rooms. Over range includes kitchen smoke and fumes. Powerful, continuous duty motor, 110-120 v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super efficient fan moves huge volume of air. 1400 to 600 CFM.
8" Fan, wt. 5 lbs. **\$6.85**
10" Fan, wt. 6 lbs. **\$7.85**
12" Fan, wt. 7 lbs. **\$8.85**
14" Fan, wt. 8 lbs. **\$9.85**
HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray painting, restaurant exhaust, paint booths, etc. 10" Fan, wt. 8 lbs. (Item 208)... **\$11.95**
12" Fan, wt. 10 lbs. (Item 109)... **\$12.95**

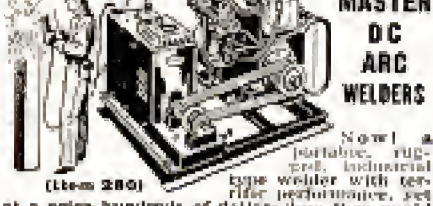


CONDITIONAL VENTILATING FANS

Save big money installing your own exhaust fan. Efficient, trouble-free type blows heavy volume of air quietly and effortlessly. Heavy welded frame — pre-drilled for easy installation. Just cut opening and bolt in place. Continuous duty motor. Ideal for auto, restaurants, garages, barns, chicken houses, etc. Control manually or with thermostat.
Blade Opening CFM Wt. Item
18" 1814" 2125 10 lb. 300A **\$27.95**
18" 1814" 3100 27 lb. 307B **\$31.95**
20" 2114" 4100 30 lb. 305C **\$39.95**
SHUTTERS—open automatically. 16" wt. 10 lb. **\$9.00**; 18", wt. 12 lb., **\$10.25**; 20" wt. 14 lb. **\$11.25**
THERMOSTATS: BARN type (range 40-60°), Wt. 2 lbs., **\$6.95**; ATTIC type (40-60°), Wt. 2 lbs., **\$11.95**



POWER MASTER DC ARC WELDERS



Now a portable, rugged, industrial type welder with terrific performance, set at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence — easily welds anything up to 3/4" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control thermostat provides hot heat soldering, brazing and welding down to 300 amps. Complete with instructions, guarantee and trade V-belt or flat policy. You can pay more, but you can't buy a better welder.
COMPLETE POWER MASTER (Illustrated above) powered by a 1 1/2 hp. air cooled Wisconsin engine. Wt. 440 lbs. (Item 280) Complete with welder casing... **\$449.50**
WELDER ONLY — DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or car engine of 14 HP or more. (Item 281) Wt. 110 lbs. **\$119.50** 8-10" value
WELDER ONLY — STANDARD MODEL. Same as above but with electric motor for heavy metal welding only. (Item 282) Wt. 110 lbs. **\$99.75**
WELDING KIT 20 to 10 lb. rods, welding helmet, electrode holder, ground clamp. Sold only with welder at... **\$10.50**

Send check or M.O. Prices I.O.B. Factory. 10 day Money back guarantee. SEND 10c for... **BIG 1954 Catalog**
MASTER MECHANIC MFG. CO., DEPT. 266 Burlington, Wis.

QUESTIONS

and

ANSWERS

about Kaiser's supercharged "power-on-demand"

Q: What is "power-on-demand"?

A: "Power-on-demand" is the new kind of power produced by Kaiser's newly designed Super-power Engine, with supercharger. It combines breathtaking acceleration and performance with small-car economy.

Q: Where else are superchargers being used today?

A: Almost every airliner you ride in uses superchargers to gain speed and altitude. They are also used in some racing cars and expensive custom jobs.

Q: How is Kaiser's supercharger different?

A: Kaiser's is a variable-drive supercharger, controlled by a solenoid switch on the accelerator. It operates whenever the engine is running, with slight output at normal speeds and maximum acceleration instantly when you step down on the gas. It's virtually silent in operation.

Q: How does it work?

A: It forces the fuel-air mixture into the combustion chamber under high pressure, for faster, more effective combustion, thus preventing starvation in any cylinder, even when driving at highest altitudes.

Q: Is it available on any other car?

A: No. It was developed by Kaiser and

McCulloch engineers as an integral part of the new engine for the '54 Kaiser Manhattan—the only production car factory equipped with a "blower."

Q: How many horsepower does Kaiser's supercharged engine develop?

A: Up to 140 h.p. at 3900 r.p.m., and up to 215 pounds of torque at 2400 r.p.m.

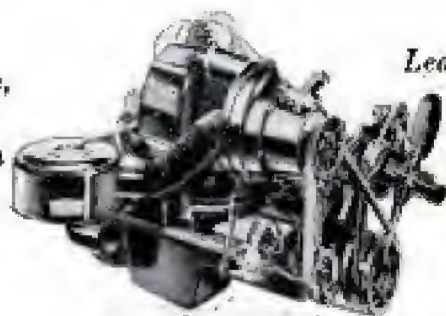
Q: Is it expensive to operate?

A: No. The small engine displacement saves money in normal driving—you pay for extra power only when you use it.

Q: How does it work with Hydra-Matic?

A: "Power-on-demand" plus Dual-Range Hydra-Matic* is the next step ahead in effortless driving. (Overdrive* also available.) Your Kaiser dealer will gladly arrange a test drive.

*Optional at low extra cost.



Learn more about
"power-on-demand"
at your Kaiser dealer's.

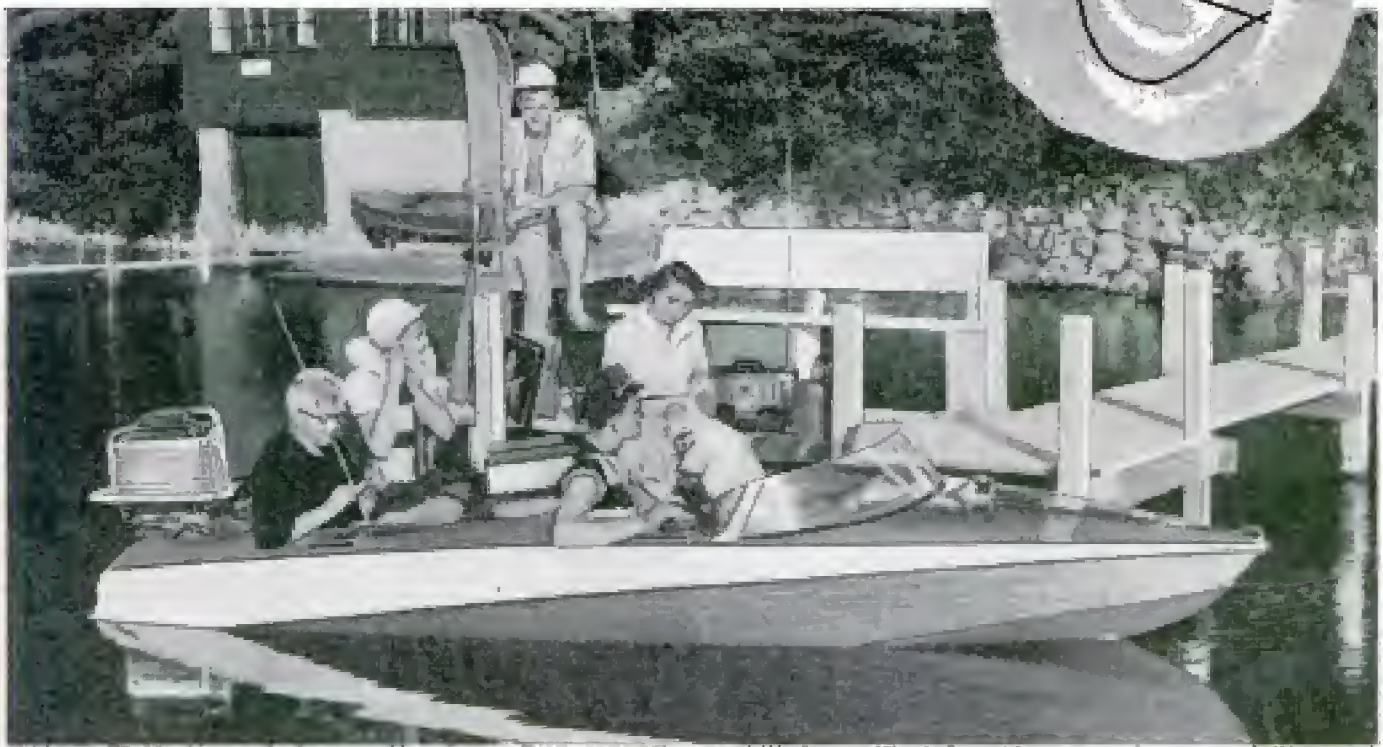
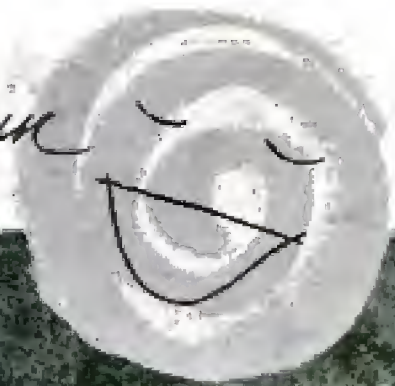


Drive with "power-on-demand" in the new

'54 Kaiser

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- "Hi-Thrust" Lower Unit
- Remote Fuel Tank
- Optional: Exclusive 12-volt electrical system — starter and generator to power lights, accessories



16 h.p. alternate
twin
MARK 20

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- Compact design—big engine performance
- Remote Fuel Tank



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twin
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- Waterproof Magneto and Spark Plugs



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twin
MARK 5

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